RTC
The magazine of record for the embedded computing industry

Also in this issue

Power Distribution

2005 Annual Article Index

December 2005 www.rtcmagazine.com

Compact PCI Express

Ready to Take the Stage

An RTC Group Publication

The Programmable Solutions Company®

John Daane, President & CEO

San Jose, CA

Consortium Affiliations

Altera is a member of a variety of industry consortiums, including the Semiconductor Industry Association (SIA) and the Fabless Semiconductor Association. Altera also partners with industry-leading EDA and IP companies throughout the world to bring technology and innovation to our customers.

Altera Corporation

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San Jose, CA 95134
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Mission/Vision Statement

Altera Corporation is the world's pioneer in system-on-a-programmable-chip (SOPC) solutions. Combining programmable logic technology with software tools, intellectual property and technical services, Altera provides high-value programmable solutions to approximately 14,000 customers worldwide. Altera® products are in communications infrastructure, computer servers, industrial applications, and the newest consumer electronics and automotive applications.

Corporate Milestones

1983	Invented reprogrammable logic technology and pioneered the fabless business model
1984	Introduced the industry's first reprogrammable logic device
1987	Introduced the first intellectual property (IP) optimized for programmable logic devices (PLDs)
1995	Introduced the first PLDs with embedded memory
2000	Introduced the first soft processor core optimized for PLDs, the Nios® II embedded processor
2001	Introduced the industry's first structured ASIC with an FPGA front end, HardCopy® structured ASICs
2002	Introduced the first true low-cost FPGA, the Cyclone™ family
2002	Introduced the first PLDs with embedded transceivers, the Stratix® GX family

Corporate Officers

John P. Daane	President, Chief Executive Officer, and Chairman of the Board
Denis M. Berlan	Executive Vice President and Chief Operating Officer
Nathan M. Sarkisian	Senior Vice President and Chief Financial Officer
Jordan S. Plofsky	Senior Vice President, Marketing
George A. Papa	Senior Vice President, Worldwide Sales

Current Product Offering

Altera's innovative products help you get to market first.

- Cyclone II FPGAs and MAX® II CPLDs for low cost
- Stratix II FPGAs for density and performance
- HardCopy II structured ASICs for high volume
- Quartus® II software for efficient development
- Nios II processor for embedded flexibility

Ready!

Design with Quartus® II development tools.

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Set!

Prototype with Stratix® II FPGAs.

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Mike Horan, President & CEO

Mission Viejo, CA

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Mission Viejo, CA 92691
Office: 949-855-3235
Fax: 949-770-3481
www.dynatem.com

Mission/Vision Statement

Our objective is to provide major equipment suppliers with a full range of CPU boards (SBC's). We offer intelligent standard, custom and semi-custom design solutions that integrate hardware, software, and customer application requirements.

Corporate Milestones

1981	founded as California Corporation
1984	purchased board level product lines from Rockwell
1987	focus shifts to VMEbus products
1996	creates fist single-slot X86 VMEbus CPU board
2005	first 10 Gb Ethernet over copper NIC

Corporate Officers

Mike Horan	President and CEO
Eileen Schmalbach	Executive Vice President
Belen Ramos	Chief Financial Officer

Current Product Offering

CPM1 Pentium M convection or conduction-cooled CPCI/PICMG 2.16 processor board

MaxCopper™ first 10 Gb Ethernet over copper Network Interface Card

RPM conduction-cooled VME Pentium M CPU board

DPM convection-cooled Pentium M Single Board Computer

PM854 PowerQuicc III computer on credit card size module

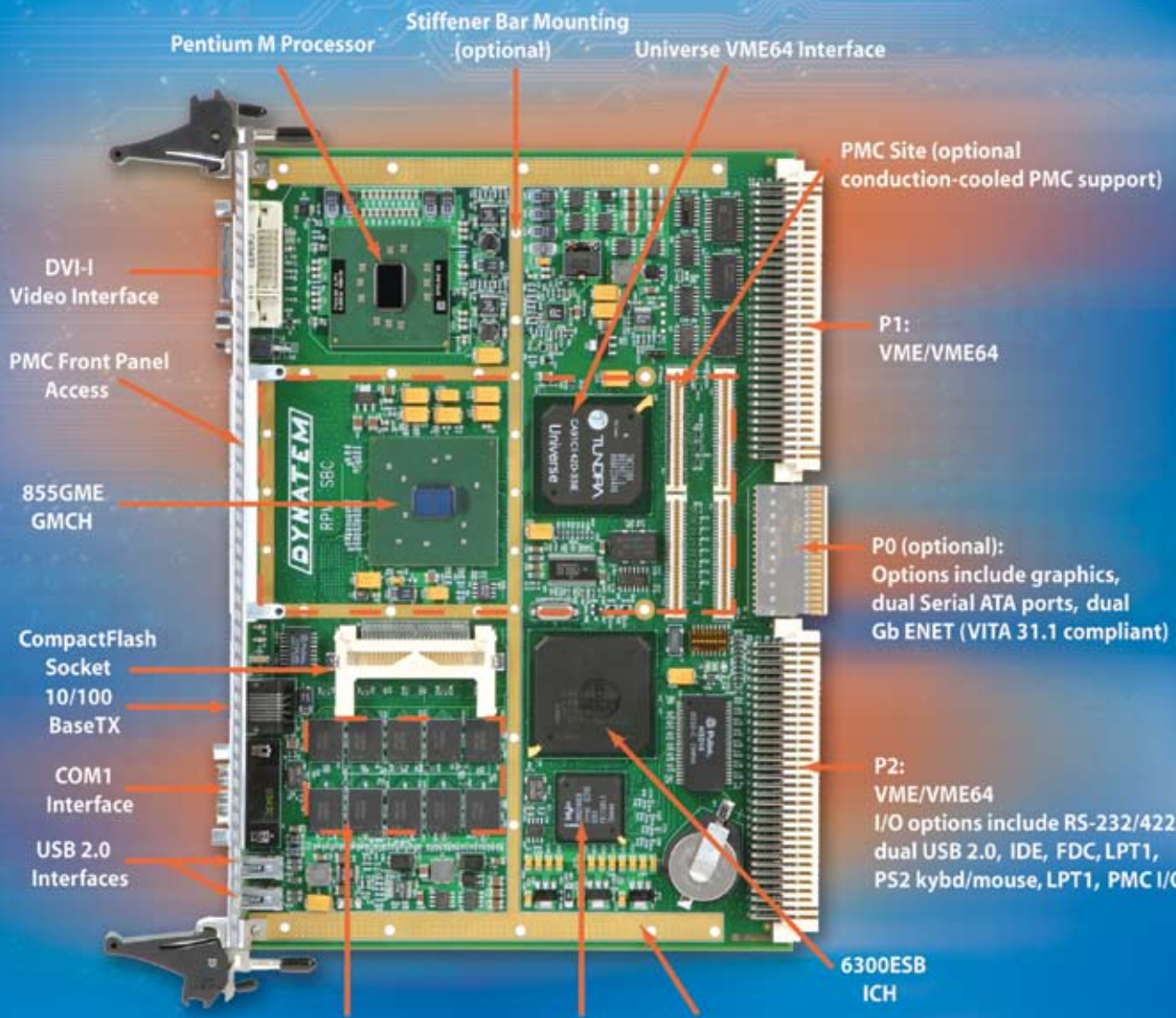
Consortium Affiliations

VITA
PICMG
Intel Communication Alliance

VMEbus Pentium M

Low-Power/High-Performance

As Rugged As You Need It!


Pentium M Processor
Stiffener Bar Mounting (optional)
Universe VME64 Interface
PMC Site (optional conduction-cooled PMC support)
DVI-I Video Interface
PMC Front Panel Access
855GME GMCH
CompactFlash Socket
10/100 BaseTX
COM1 Interface
USB 2.0 Interfaces
P1: VME/VME64
P0 (optional): Options include graphics, dual Serial ATA ports, dual Gb ENET (VITA 31.1 compliant)
P2: VME/VME64 I/O options include RS-232/422/485, dual USB 2.0, IDE, FDC, LPT1, PS2 kybd/mouse, LPT1, PMC I/O
6300ESB ICH
Up to 1 GB DDR-266 DRAM
82546 dual Gb ENET
Wedgelock Mounting (optional)

DPM FEATURES

- NT, XP, Linux, VxWorks and Solaris all run on-board and there's PXE support for diskless booting in secure systems
- Two Gb Ethernet ports in compliance with VITA 31.1 for backplane fabric switching
- USB 2.0, DVI-I Graphics, Serial ATA, and PCI-X are integrated into the Chipset
- Rugged, extended temperature versions are available with wedgelocks and conduction cooling in compliance with IEEE 1101.2. Speed-step capable.

AVAILABLE FROM COMMERCIAL TO FULL MIL

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Pioneer Magnetics

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Industry / Market Leader

- Power Factor Correction -- Patent holder for wide range active (PFC)
- Hot plug technology -- commonly used by all high tech industries
- Single wire current sharing
- Active 3 Phase PFC up to 95%
- 5" X 8" X 11" package – Set standard dimensions for high power
- 5VDC @ 200A, 300A, 450A, 600A, etc. – First on the market
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- 3 KW in 3U package
- 5 KW in 3U package
- 8 KW in 3U package
- 10 KW in 3U package
- 1.5 KW in 2U package
- 3 KW in 1U package
- 9 KW's in 1U rack / power shelf
- > 20 watts per cubic inch
- 480 Single & three phase PFC (AC-DC)
- Wide-range current / voltage programming
- Intelligence built into power supply, rack / power shelf & system
- Largest patent position
- DMTBF is typically - 1 Million Hours

Pioneer Magnetics, Inc.

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Santa Monica, CA 90404
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PMI@PioneerMagnetics.com

Mission/Vision Statement

Pioneer Magnetics is committed to providing defect-free product and service to all customers, on time, every time. Our corporate goals are: Customer Satisfaction, Product Reliability, Total Quality Management and Profitability. PMI manufactures in the United States and offshore.

Corporate Officers

Dr. Allen B. Rosenstein	CEO, Chairman of the Board
Jerry Rosenstein	President & COO
Denny Wood	Controller

Current Product Offering

· Power Supplies: 1KW to 10KW in a 5" X 5" (Height X Width) or smaller sizes

· AC-DC and DC-DC

· Power racks / shelves: 19" to 30"

· Battery Plants

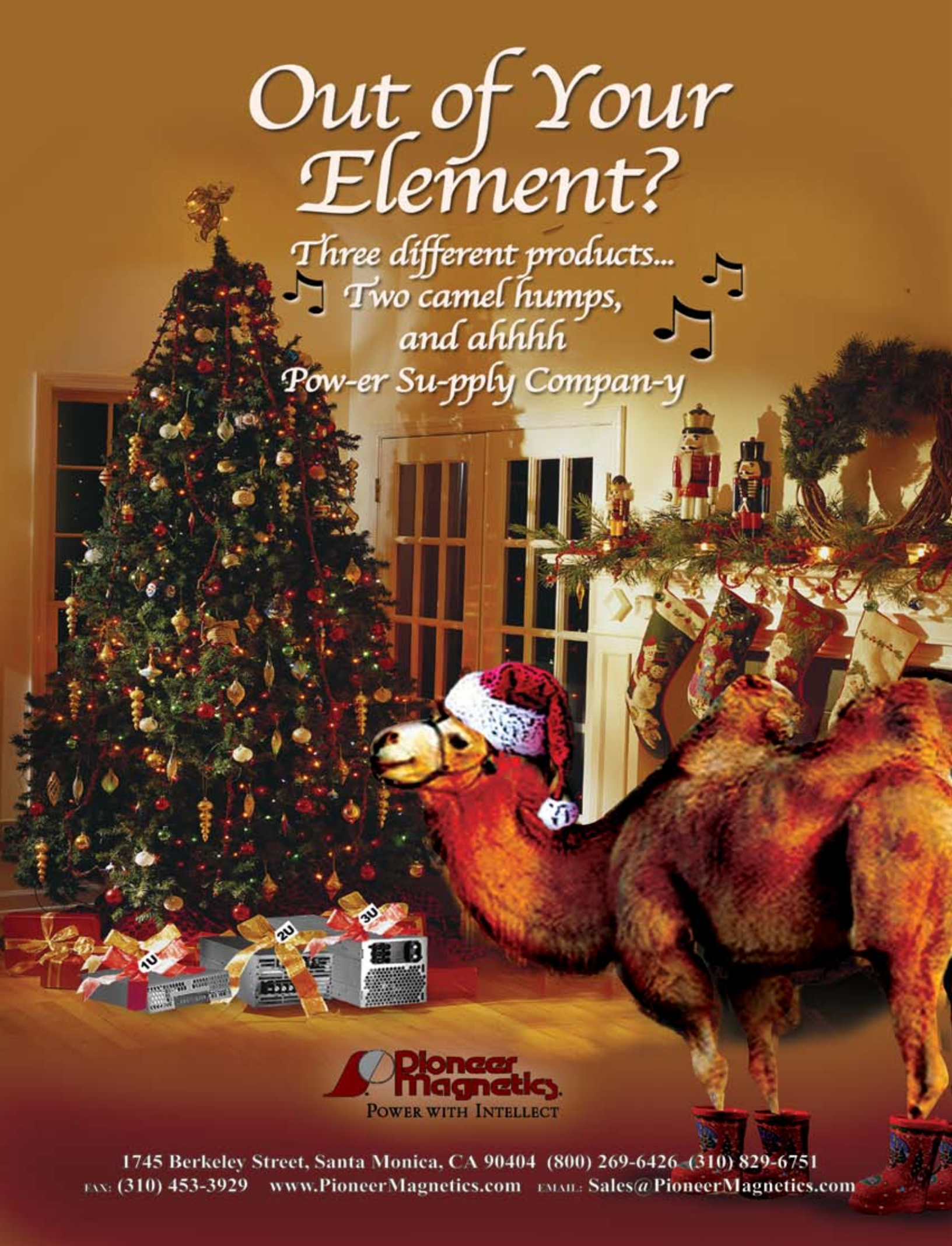
· Power Delivery Systems: > 100 kW's

· System & software design services

· Value added and contract manufacturing

· COTS

· Outsourcing services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and ahhhh
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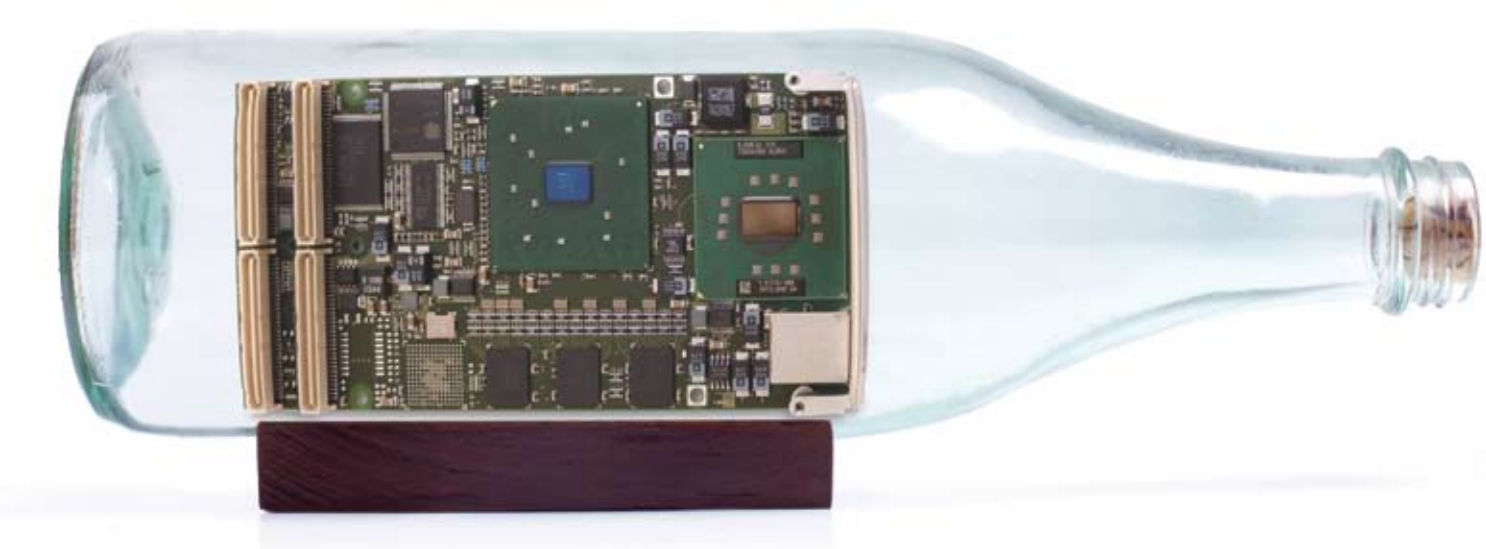
How'd they do that?



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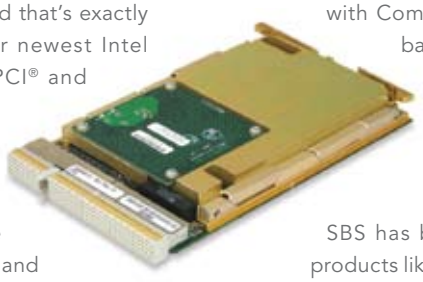
Pack the power of an Intel® Pentium® M processor into tight quarters.

Intel® Communications Alliance
Associate Member
SILVER

THESE DAYS, designers want a lot of processing power in a very small package. And that's exactly what SBS has delivered with our newest Intel Pentium M-based 3U CompactPCI® and PrPMC single board computers.

These fast, compact modular building blocks are perfect for space-constrained applications like avionics, network edge, industrial and vehicle management systems. The PSL09 PrPMC, for example, runs at speeds of up to 1.4 GHz, offers up to 256 MB DDR SDRAM and supports Microsoft® Windows® XP, VxWorks® and Linux®. It is compatible with CompactPCI 2.15 and features a high bandwidth 400 MHz bus between the processor and chipset. The CR4 3U board is even more impressive, with twice the RAM and a rugged, conduction cooling option.



CR4
3U CompactPCI Conduction Cooled
Intel Pentium M processor
Single Board Computer

SBS has been designing small, powerful products like the PSL09 and the CR4 for a long time now, so we know how to pack big capabilities into a small space. Because of our experience, we know that sometimes less really is more.

SBS Technologies

SBS knows. Find the compact Intel Pentium M processor board you're looking for at **www.sbs.com** or call **800.SBS.EMDEDDED**

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Steve Cooper, One Stop Systems

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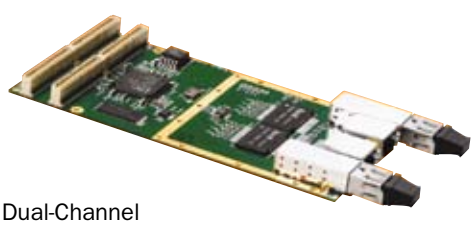
A complete guide to the year's technical feature articles

On the cover: Hardware products supporting the new CompactPCI Express specification are getting ready to enter the market. Shown here are a 3U cable interface board, a 6U backplane with different slot types for Compact PCIe and a chassis that supports both CompactPCIe and legacy CompactPCI slots—all from One Stop Systems.

A potential layout for a CompactPCI Express backplane. In this example, the power studs are located between the slots, providing maximum space savings. • **Pg. 30**

CompactPCIe 3U cable interface board • **Pg. 40**



Dual-Channel Gigabit Ethernet PMC Card • **Pg. 58**

Event Calendar

01/10-12/06
AFCEA/USNI West
San Diego, CA
www.west2006.org

01/16-17/06
Bus & Board
Long Beach, CA
www.busandboard.com

01/24-26/06
TechNet Orlando
Orlando, FL
www.afcea-orlando.org

01/26/06
Real-Time & Embedded Computing Conference
Copenhagen, Denmark
www.rtecc.com/copenhagen

01/26/06
Real-Time & Embedded Computing Conference
San Jose, CA
www.rtecc.com/sanjose

02/06-09/06
Components for Military & Space Elec. Conference
Los Angeles, CA
www.cit-us.com

If your company produces any type of industry event, you can get your event listed by contacting sallyb@rtcgroup.com.

This is a FREE industry-wide listing.

Doug Patterson, VP
Worldwide Sales and Marketing

Chatsworth, CA

Aitech Defense Systems

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www.rugged.com

Mission/Vision Statement

Aitech Defense Systems leverages its expertise in dual-use technologies - where military applications take advantage of advances in the commercial and/or civil markets, and vice versa and provides industry standards-based VMEbus, CompactPCI and advanced serial fabric hardware and software architectures for board and integrated subsystem solutions to the commercial, civil aviation, industrial and military markets.

Corporate Milestones

1983	Aitech founded
1985	First company to develop true military SAVA (Standard Army Vetronics Architecture) compliant, VMEbus SBC.
1986	First, and still only, company to qualify full product line for temperature range of -55°C to +85°C.
1994	Achieves ISO 9001:2000 certification.
1996	First company to supply and radiation-qualify multiple VMEbus products for International Space Station (ISS).
1997	Achieves Boeing Qualification Management System (BQMS) certification.
Jan 2003	Achieves SAE AS9100:1999 certification.
Oct 2004	Shifted International headquarters to Chatsworth, California to better serve customers.

Corporate Officers

Roger Rowe	Chief Executive Officer
Doug Patterson	VP, Worldwide Sales and Marketing
Chuck Parks	VP, North American Sales
Steve Motter	VP, Engineering
Shephard Girion	VP, Programs

Current Product Offering

Aitech offers military and space-qualified, commercial off-the-shelf (COTS) products for defense, aerospace and space applications, radiation tolerant and MIL-SPEC solutions; providing VMEbus and CompactPCI SBC and I/O boards, powered subsystems, mass memory, enclosures and hardware subsystem integration along with configuration and component obsolescence management services.

Consortium Affiliations

VITA
PICMG
AUSA

Aitech.

On land or in the air... there is no "or equal."

For land-based or airborne applications, the military needs COTS embedded sub-systems that deliver the optimum combination of performance, reliability, cost and rapid time-to-market. And Aitech has delivered just that since 1983!

*We're still in front…*Aitech got a big jump on everyone way back when…and we've kept well ahead of the pack in developing advanced embedded sub-systems based on leading edge commercial technologies adapted to harsh environment applications.

We don't compete with you... A lot of board level companies claim to be systems integrators. We don't. We leave the systems integration to the companies that do it best: our customers...companies just like yours!

*We have what it takes…*Our VME and CompactPCI SBCs, PMCs, memory, I/O, graphics and chassis are in a class by themselves. And they're backed by world class software and technical support, program and lifecycle management, testing and more.

*We've been there…*Aitech sub-systems are in widespread use in the world's most demanding military/aerospace applications: from radar, missile and weapons control to mission-critical data voice sub-systems...from mission computers and display consoles to ECM, sight head stabilization and counter measure control…from power control and conditioning to advanced imaging systems. And that's just for starters.

*Don't' take our word for it...*Compare Aitech's offerings and expertise to any company in the COTS embedded marketplace. Land or air. Or for that mater, sea or space. Come to talk to us.

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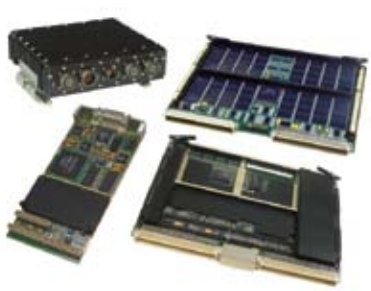

SBE, Inc.

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info@sbei.com www.sbei.com

Mission/Vision Statement

SBE's goal is to deliver exceptional value to OEM customers by providing IP-based hardware and software solutions that set the standard for interoperability, state-of-the-art functionality and ease of integration. SBE maintains an unwavering focus on meeting this goal which extends from product design and system operation through support and business operations.

Recent Corporate Milestones

Oct. 19, 2005	Demonstrated iSCSI over 10G at SNW Orlando; Achieved enterprise level performance without need for costly infrastructure investments
Sept. 19, 2005	Introduced high density Voice over Packet gateway engine with OC-3 capacity for carrier class VoIP infrastructure applications
Sept. 12, 2005	Launched programmable DSP module featuring up to 8 Texas Instruments C6415 DSPs for voice/video/data/wireless applications
July 26, 2005	Completed acquisition of PyX Technologies to complement SBE's portfolio with pioneering iSCSI software solutions
July 22, 2005	LSI Logic and PyX signed iSCSI deal allowing LSI to integrate the PyX iSCSI stack into its intelligent iSCSI MegaRAID® solution
July 6, 2005	OnStor licensed the PyX iSCSI software for use in their Bobcat NAS gateway products
June 6, 2005	Introduced quad port Gigabit Ethernet AdvancedMC card for AdvancedTCA and MicroTCA systems
June 5, 2005	Announced new PowerPC-based intelligent blade platform for Linux-based telecommunications applications

Dan Grey, President and CEO

Corporate Officers

Dan Grey	President & CEO
David Brunton	Vice President of Finance & CFO
Greg Yamamoto	Vice President & General Manager, Storage Group
Steve Nester	Vice President & General Manager, Embedded Group
Andre Hedrick	Chief Technology Officer

San Ramon, CA

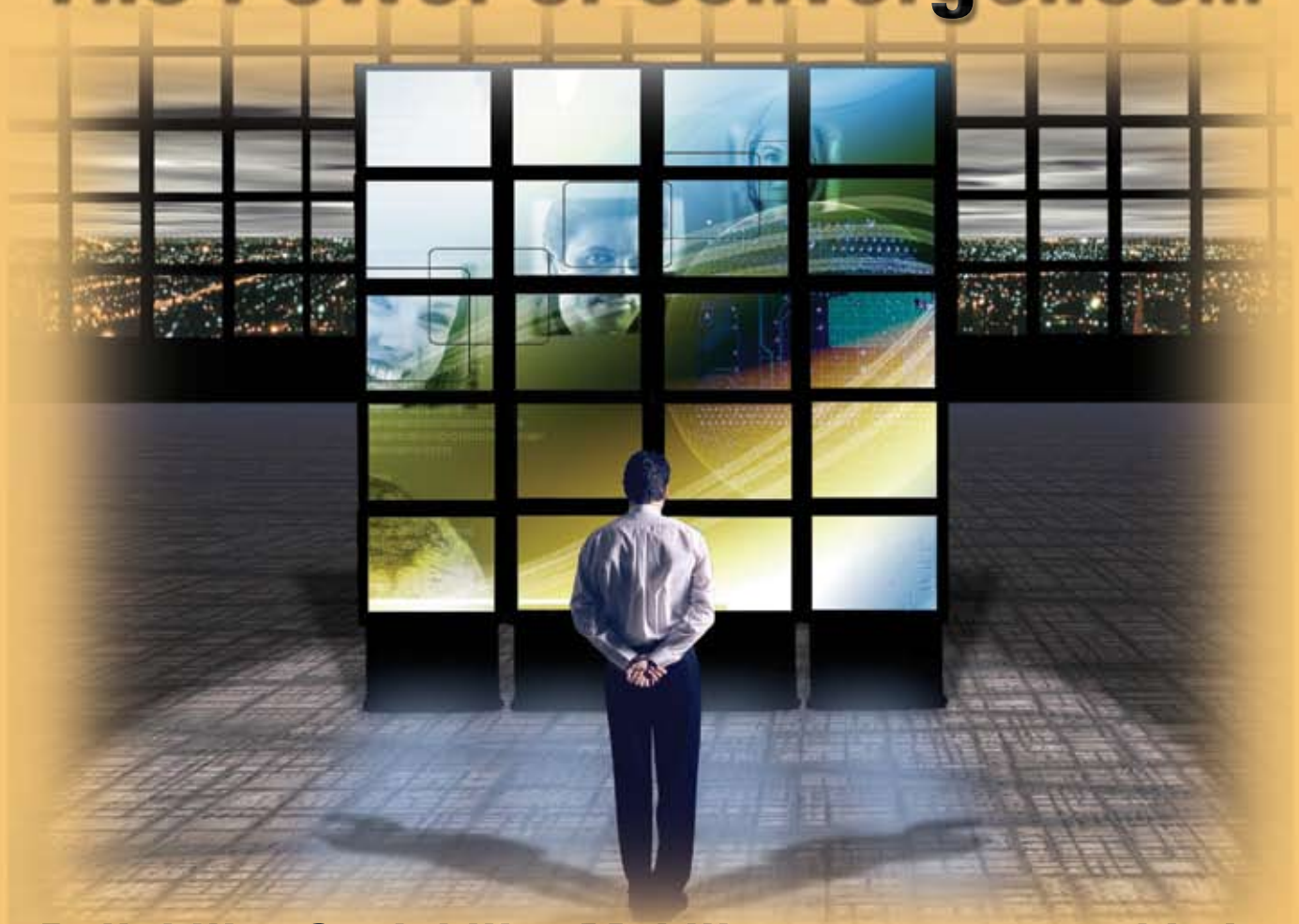
Current Product Offering

SBE delivers a portfolio of scalable, standards-based hardware and software IP-based products designed to enable optimal performance and rapid deployment across a wide range of next generation embedded and storage systems. Our products include board-level DSP/VoIP, WAN, LAN/Ethernet, Encryption, and intelligent processor platforms, as well as pioneering iSCSI software for storage transport.

Consortium Affiliations

SBE enables rapid application deployment and smooth integration into OEM customer products by utilizing and supporting industry standards-compliant hardware and software development. SBE actively contributes and participates in key industry organizations, such as the Storage Networking Industry Association ("SNIA"), VME International Trade Association ("VITA"), and PCI Industrial Computers Manufacturers Group ("PICMG").

The Power of Convergence...



Reliability. Scalability. Mobility...on a gateway blade.

Open architecture drives costs down and performance up.

Modular VoIP "blades" based around standard, interoperable modules like PMC and AdvancedMC reduce costs by limiting the number of unique blades that telecom OEMs and carriers have to purchase and stock. A softswitch or media gateway controller can be deployed in a minimal configuration and scaled up later (to OC-3 and beyond) without replacing the whole blade and without taking it offline. SBE provides high-performance DSP resource modules that deliver premium carrier class voice processing with world-class features using Texas Instruments' DSPs with Telogy Software. In addition, these modules support transcoding and transrating to enable the integration of voice, video, data, and wireless.

SBE products are scalable from daughterboard modules to complex gateway blades, and provide telecom carriers/service providers with a choice of programmable voice platforms featuring SBE's line of network interface cards, ranging from T1 and T3 to Gigabit Ethernet and IPsec/SSL/WLAN acceleration. Full Linux support is available on every board.

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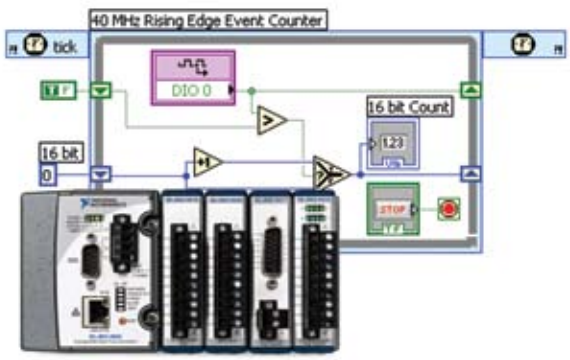
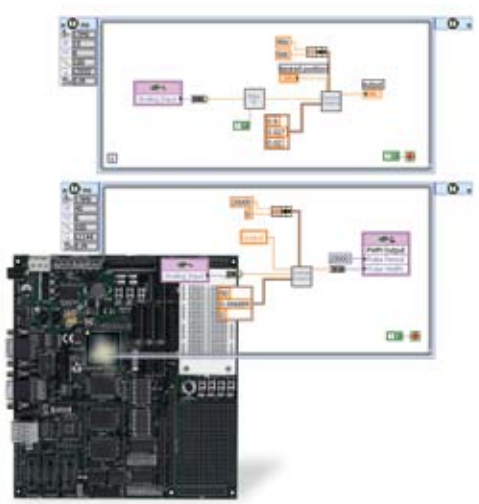
- Native simulation capabilities
- Built-in analysis and I/O



Prototype with LabVIEW

- Reconfigurable FPGA I/O
- COTS prototyping platform



Deploy with LabVIEW

- 32-bit processor deployment
- Same environment from algorithm design to implementation

LabVIEW

Graphical Development Platform for Design, Control, and Test

- Intuitive embedded programming representation
- Rapid application development
- Built-in I/O connectivity and ready-to-run analysis

Improve your productivity with LabVIEW Graphical System Design.
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2005-5949-821-101-D

NATIONAL INSTRUMENTS™

Larry Traylor, CEO

Tustin, CA

American Arium

14811 Myford Road, Tustin, CA 92780
Phone: (877) 508-3970 Fax: (714) 731-6344
Website: www.arium.com
E-mail: info@arium.com

Mission/Vision Statement

American Arium's mission is to meet and exceed the needs of hardware and software developers by giving them the right tools to help them minimize their debug cycle. The company focuses on providing solutions to best meet customers' needs, offering excellent hardware and software products and in-depth technical support.

Corporate Milestones

2/05	Introduced ARM GByte trace JTAG emulator/640 MHz trace capture speed
1/05	Delivered debug of Linux dynamically-loaded kernel modules with full source available at init
8/04	Launched first full-featured, JTAG-based Linux debug solution
4/04	Introduced Intel® Platform Innovation Framework for EFI (Tiano) C-source debug support
1/04	Offered true ARM ETM real-time performance analysis with 10ns resolution
9/03	Launched easy-to-use multicore debug environment for ARM/XScale developers
6/03	Delivered terminal display in debugger without serial port/ video device on Linux target
3/03	Introduced virtual deep trace and PLD programming in ARM JTAG emulator

Corporate Officers

Larry Traylor	CEO
Jeffrey Acampora	Vice-President, Sales & Marketing
Diane Dirks	Chief Financial Officer

Current Product Offering

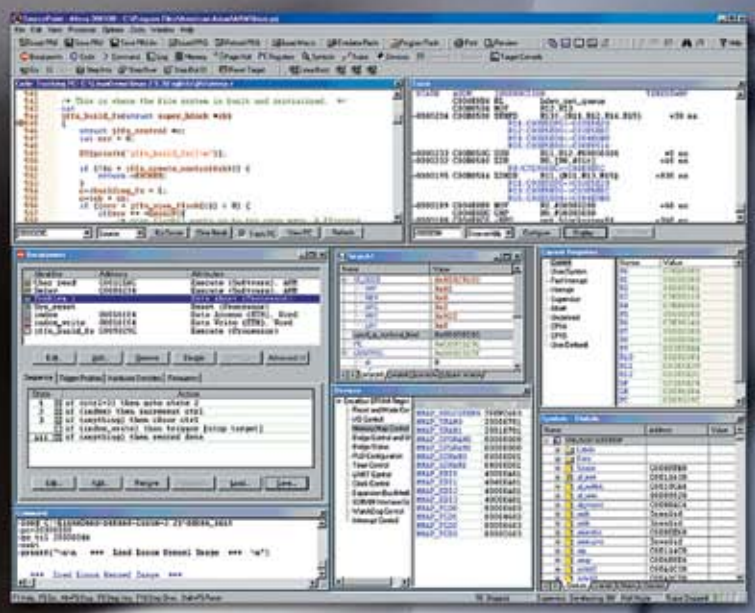
American Arium delivers JTAG in-circuit emulators and debugger solutions for embedded system and Linux development and the personal computing industry. The company's product line supports ARM 7™, ARM9™, and ARM11™, Intel Xscale®, Intel X86 processors, and several AMD 32- and 64-bit processors. Visit Arium's web site at www.arium.com.

Consortium Affiliations

Arium Partnerships & Alliances:
Altera
ARM Connected Community (ACC)
ASSET Intertech
Atmel
Cogent Computer
Freescale Design Alliance
Intel Communications Alliance
Intel PCA Developer's Network
Microtronix
MontaVista Software

The Complete Development Solution

Arium offers robust JTAG emulation and development tools for today's embedded software engineers using targets with ARM7™/ARM9™/ARM11™, Intel XScale®, and TI OMAP™ cores and Intel® Pentium® processor families.



- Full symbolic, source-level Linux kernel debug and source-level process debug; seamless debug between them! No other vendor offers this powerful feature at any price.
- Real-time, integrated ETM trace data collection at 640 MHz and a GByte of trace memory.
- Highly integrated SourcePoint™ IDE with powerful, flexible code editing with debug integration.
- Real-time performance analysis for faster, more accurate results.
- Fast, easy, intuitive run control with robust C-like command language facilities.
- SourcePoint debugger available for Microsoft® Windows® and Linux hosts.

It's hard to compete without the right tools!

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SEALEVEL
SYSTEMS INCORPORATED

Thomas B. O'Hanlan, President & CEO

Liberty, SC

Sealevel Systems, Inc.

155 Technology Place
Liberty, SC 29657
tel. (864) 843-4343 fax. (864) 843-3067
http://www.sealevel.com
sales@sealevel.com

Mission/Vision Statement

Sealevel Systems, Inc. is dedicated to providing innovative, reliable hardware and software products that enable computer connectivity and control. We will continually develop new products that leverage emerging technology to deliver increasingly effective solutions to our customers.

Corporate Milestones

1986	Launched first product, a one-port ISA board selectable for RS-422 or RS-485 interface
1994	Invented the RS-485 auto-enable circuit that automatically handles RS-485 driver enable
1997	Introduced Sealevel's first PCI card, a two-port RS-232/422/485 multi-interface serial product
2001	Announced Sealevel's full line of USB to serial adapters
2002	Launched new line of Ethernet serial servers that network enables legacy serial devices
2004	Announced Sealevel's SeaI/O family of distributed data acquisition and control products
2005	Released industry's first RoHS-compliant multi-interface serial I/O board
2005	Moved operations to 45,000 square foot facility to accommodate growth

Corporate Officers

Thomas B. O'Hanlan	President and CEO
Ben O'Hanlan	Chief Operating Officer
Earle Foster	VP, Sales and Marketing

Current Product Offering

Since 1986, Sealevel Systems, Inc. has manufactured serial and digital I/O products recognized as best in class by top commercial, military, and aerospace companies. We currently offer over 250 standard I/O products enabling interface to host systems via Ethernet, USB, or a variety of bus types including PCI, PC/104, and PCMCIA.

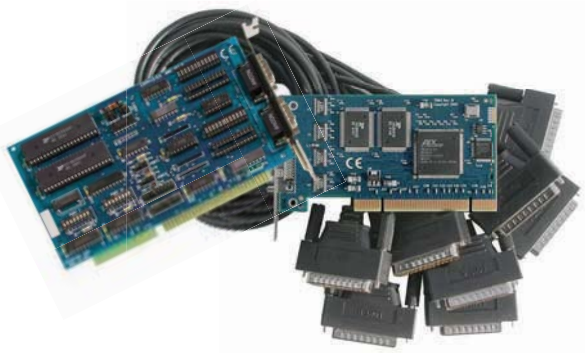
Consortium Affiliations

PC/104
PCI-SIG
PCMCIA

We Listen. Think. And Create.

Simpler Solutions.

PCI & ISA Boards



Dependable consistency. For almost 20 years, customers have depended on Sealevel's innovative serial and digital I/O boards. Our industry-leading product line continues to expand, and our commitment to product continuance guarantees that the board you design in today will be available for years to come.

Remote Data Acquisition Modules

Distributed control. We've taken Sealevel's I/O expertise out of the PC with our Seal/O remote data acquisition modules. Connect to a host via Ethernet, USB, RS-485, or RS-232 and daisy chain up to 246 Seal/O modules to create a comprehensive control and monitoring network.

Solid-State Embedded I/O Servers

Powerful computing. Your trusted I/O supplier is now your system-level solution. We've combined Sealevel's proven I/O with state-of-the-art fanless processors to produce the Relio family of solid-state embedded I/O servers. For the first time, you can experience the reliability of a PLC and the configurability of an industrial computer in one rugged package.

Custom & RoHS-Compliant Solutions

Clean solutions. Response is paramount at Sealevel. Whether it's designing a custom board to exactly meet a customer's requirements or complying with the new RoHS directive across our entire product line, Sealevel is your proactive partner.

SEALEVEL
SYSTEMS INCORPORATED

Tel: 864.843.4343 » www.sealevel.com

GE Fanuc Embedded Systems

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web: www.gefanuc.com/embedded
email: sales.embeddedsystems@gefanuc.com

Mission/Vision Statement

GE Fanuc Embedded Systems is a leading provider of Embedded Computing equipment and solutions. With a single goal of improving our customers' productivity, we focus on providing open architecture platforms and rapid custom configurations. Backed by the reliability, innovation and global support of GE, GE Fanuc is a strategic partner in your business.

Corporate Milestones

GE Fanuc Embedded Systems was formed through the acquisition of some of the best companies in the embedded solutions industry:

2001	VMIC. A powerful portfolio of SBCs, Embedded PCs, reflective memory, I/O, IIOC and more
2003	RAMiX. A leader in switches, network interface cards, server blades, and other communications and networking products
2004	Computer Dynamics. Packaged solutions in flat panel computers, hazardous and rugged area computers, military monitors and more
2005	DNA Computing Solutions, Inc. This product and technology purchase added a multiprocessor PowerPC portfolio, along with core ruggedized capabilities

Corporate Officers

Jeff Garwood CEO

Current Product Offering

- Single Board Computers
  Intel-based VME and CompactPCI solutions
- PowerPC Multiprocessors
  High performance shared & distributed memory architectures.
- Communications & Networking
  Ethernet solutions, Reflective Memory, Embedded Switches and Serial/Multi-functional I/O
- Data Acquisition & Control
  I/O controllers, servers and PLC accelerators with customized functions and an open control platform.
- Expansion Cards & I/O Modules
  Networking, storage, hard drives, video and graphic interfaces and a variety of I/O combinations.
- Storage & Memory
  Fully compatible solutions for your storage and memory needs.
- Embedded Software
  A complete selection of software solutions for driver and board support.
- Accessories
  Chassis, power supplies, backplanes along with a full range of fan assemblies and cables.
- Flat Panel Monitors and Computers
  Rugged and reliable flat panel and hazardous area products.

Embedded Systems

Jeff Garwood, CEO

GE Fanuc Headquarters
Charlottesville, VA

Consortium Affiliations

VITA
PICMG

GE Fanuc Automation

Embedded Performance.

Looking for an embedded computing solution that gives you a tremendous advantage over your competition? Look no further than GE Fanuc Embedded Systems.

Featuring a comprehensive offering that includes Intel-based SBCs and complete I/O systems, industry-leading communications technology, rugged flat panel monitors and computers and more,

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Learn more at www.gefanuc.com/embedded

Talon 8400
Self Contained
Embedded PC

- Intel 733 MHz Celeron M processor
- 256 MB of PC100/PC133 SDRAM
- Dual Ethernet ports
- Two Cardbus/PCMCIA slots
- Three PC/104-Plus slots
- 20 GB hard drive
- Integrated power supply
- Fanless operation
- Windows XP Pro OS
- Extended temperature and hazardous area models

CPCI-7808
Intel Pentium M CompactPCI
Single Board Computer

- PICMG 2.16/2.9 compliant
- Processor speeds up to 1.8 GHz
- Up to 2 GB DDR SDRAM
- Dual PMC sites
  - 64-bit/66 MHz site
  - 32-bit/33 MHz site
- Dual 10/100/1000 Ethernet Interface
- Dual 16550-compatible serial ports
- Three USB 2.0 ports
- Serial ATA interface
- Up to 1 GB CompactFlash
- OS support for Windows XP, Windows 2000, QNX, Linux, and VxWorks

PMC696
Intelligent Dual Gigabit Ethernet
PCI Mezzanine Card

- On-board high performance RISC processor
  - Up to 128 Mbytes of ECC DDR SDRAM
  - Dual Gigabit Ethernet options
  - Built-in Ethernet failover capability
- 64 bit/66MHz PCI-X internal high speed bus
- Dual Gigabit Ethernet options
  - Fiber, 1000BaseFX
  - Copper, 10/100/1000BaseTX
- Trunking capabilities

CP920
CompactPCI Managed
Gigabit Ethernet Switch

- PICMG® 2.16 compliant
- Layer 2/3/4 switching
- Twenty-four 10/100/1000 Ethernet ports
- PICMG® 2.9 Rev 1.5 IPMI compliant
- PICMG® 2.1 Rev 2.0 hot swap compliant
- 802.1p, 802.1Q VLAN, deep packet filtering, link aggregation, Rapid Spanning Tree (802.1w, 802.1d), broadcast storm control, port mirroring
- Conduction cooled model available
  - Twelve 10/100/1000 Ethernet ports

GE FANUC

Embedded Systems

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Cool. Calm. Collected.

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Cool.

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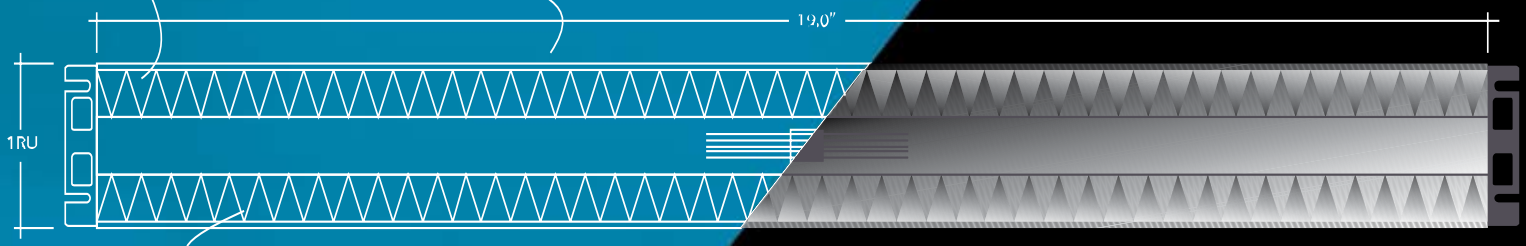
Calm.

Standardized mechanical footprint designed to survive in high shock and vibration environments - up to 40G shock and 1 grms vibration.



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Scalable - up to 16 processor cores. High-density, processor-independent architecture implemented with SPARC®, IBM®, PowerPC and x86 technology. Solaris™, Windows®, and Linux® operating systems. All networked in a single system. All managed in real-time.

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Transformational.

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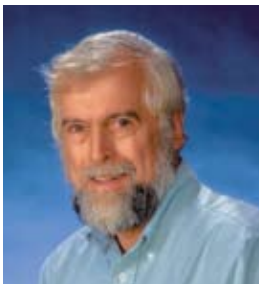

by Tom Williams, Editor-in-Chief

RoHS Upheaval May Be Far Wider than We Imagine

Is there a "law of unintended consequences" that makes chaos of what seemed at least on the surface to be good intentions? Or is it a law of reversed purpose that, like Mephistopheles in Goethe's *Faust*, "always wishes evil while always doing good?" The European Union's Restriction of Hazardous Substances (RoHS) directive may be such a beast. Designed to reduce six hazardous substances in the environment, the mandate has consequences for the electronics industry that reach far beyond making companies redesign their products. It will, for example, cause a large number of board-level products to simply be discontinued. Its effect on the manufacture of semiconductors could be even more far reaching because it threatens to drastically alter the implementation of new designs and perhaps cut off the continued use of legacy designs.

There is no doubt that a large number of board-level products as well as semiconductor products will simply be sent to the realm known as end-of-life (EOL), which means that a notice may be given that they will no longer be manufactured after a certain date. After that date they will only be available as long as inventories last unless some manufacturer chooses to license them to sell (at premium prices) to manufacturers whose products depend on them. EOL can be a road to nowhere but in some cases it can result in a product's continued availability as long as it has a niche need and a market, as for example, the venerable 386 processor, which along with its support chipset, is still available in the embedded world.

The enforcement of RoHS will inevitably result in the EOL of large numbers of ICs. Certain of these ICs are vital to entire lines of products while others can be relatively easily replaced or substituted. A case in point may involve the PCI bus. It is fairly clear that there is a transition underway from the PCI interconnect standard to PCI Express. In the desktop PC arena huge numbers of motherboards have PCI slots for a dazzling array of peripheral cards that plug into them. More recent reference designs and products have featured a mix of PCI and PCI Express slots on the motherboards. As the industry transitions to the newer, faster interconnect, users are still able to include legacy PCI cards with their newer PCI Express components. In the embedded world, if you want to plug a PMC card onto a VME or CompactPCI carrier card, you need an IC to do the PCI bridging.

There are reports that, partially as a result of RoHS, PCI bridging chips might become the victims of EOL as semiconductor manufacturers decide not to redesign them but rather to embrace RoHS-compliant PCI Express silicon. As a result, some sources say newer PC reference designs are showing up with PCI Express and no provision for legacy PCI cards. For PC users who upgrade every couple of years this may not be a traumatic problem. However, for embedded developers who must support products over five or ten years, it could be devastating. It could even obviate the market for existing mezzanine cards. If the supply of bridge chips were to run out, it would kill off even existing designs of carrier cards as well.

If large manufacturers want to quickly move their large market (PC users) to PCI Express, that market can probably take the jolt. RoHS is a big motivator to drop old ICs that can't be sold in large numbers in Europe anyway, and rather than redesign them for a market that is already in transition away from PCI, simply relegate them to EOL. The embedded market is too small for them to be interested in a redesign that could mean more than simply the packaging, but could also involve requalifying the silicon for the higher soldering temperatures, etc., and at least raise doubts about reliability. Some independent manufacturer might be motivated to license the designs and offer legacy chips, but there is no certainty and in any event, they would be orders of magnitude more expensive.

Of course, the military relies on these same products and designs and is not about to simply abandon them and redesign all its legacy gear. There is every reason to expect that we will see some revival of the old Mil-Spec world simply because certain key COTS components are no longer available on the COTS market and they are vital to the continuation of higher-level COTS products and systems. It could mean the reappearance of the $600 toilet seat in the form of integrated circuits. In that case, they would not have to be RoHS-compliant, but simply a continuation of existing products. Still, they would have to come from some dedicated manufacturer or manufacturing process within a larger semiconductor house and would not help U.S. manufacturers who wish to sell into the European market.

The foregoing sounds dire and so it will be if things play out as predicted. Still that is only one scenario among many more that are possible and that we have not yet considered. Expect large numbers of semiconductors to go EOL as RoHS comes into play and expect those EOLs to have unpredictable ripple effects. We really have as yet no idea how extensive the fallout will be. ◢

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Dan Kilcourse, Sales Manager

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Email: info@embeddedsys.com
URL: http://www.embeddedsys.com

Mission/Vision Statement

The Micro/sys mission is focused on providing customers with embedded single board computers and I/O devices that are designed and manufactured for rugged applications. Micro/sys manufactures boards that are highly integrated, easy to use, and support the user's choice of operating system. Micro/sys CPUs are compact to fit small spaces and can operate in extended temperature ranges. Micro/sys is also focused on strong customer support. Application Engineers meet the needs of customers' unique systems, and will even customize a board to fit these specifications. Micro/sys embedded computers are specified by OEMs in semiconductor processing, medical, mail handling, pharmaceutical, industrial marking, process control, and many other industries.

Embedded Innovations

2005	EPIC and EPIC Express Micro/sys was a co-creator of this new standard
2004	EDN Innovation Finalist SBC4495 Single Board Computer with A/D, D/A and GPS
2003	ECN Excellence Award
2000	Embedded Linux Consortium Original Member

Corporate Officers

Susan Wooley	President
Dan Kilcourse	Sales Manager

Platforms Supported

PC/104
PC/104-*Plus*
5" x 5"
EPIC
EPIC Express
EBX
STD
Custom

Consortium Affiliations

PC/104 Consortium – Board Member and Past Chairman
Microsoft Windows Embedded Partner
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Wind River Partner
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And our wide selection of cost sensitive A/D and D/A boards is something that will make any princess happy.

We invite you to check out our 12, 14, 16 and 24-bit A/D and D/A single board computers from 12MHz to 533MHz, including VGA, CompactFlash,® Ethernet, GPS, CAN, wireless, and the operating system of your choice.

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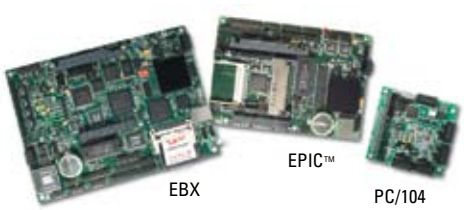

24-bit A/D
Our MPC624 provides 24-bit A/D for PC/104 with four channels of instrument grade voltage measurement and/or four channels of direct connect to off-the-shelf sensors.

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Our headless Pentium,® the SBC2596, offers Ethernet, GPS, CAN, DC/DC converter, and CompactFlash on EBX form factor with full 16-bit A/D and 14-bit D/A.

14-bit A/D, 14-bit D/A
Our SBC4495 is a 486/586 EPIC form factor with 14-bit A/D and D/A, VGA/Flat Panel, PCMCIA, wireless, and GPS.

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Les Goodman, President & CEO

Consortium Affiliations

Arcom is a Gold level Microsoft Windows Embedded partner and an Advanced Level Business partner for IBM. Arcom is also an active Nextel solution developer, member of the Intel Communications Alliance and works closely with Wind River Systems. Arcom is a member of the PC/104 Consortium and ZigBee Alliance.

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e-mail: sales@arcom.co.uk

Mission/Vision Statement

To develop lasting partnerships with customers who require high integrity products for industrial control, communications and embedded system applications.

Through continued focus on the needs of our customers, Arcom will become the preferred supplier of equipment where product quality, stability of supply. Technical support and cost effectiveness are of paramount importance

Corporate Officers

Les Goodman	Group President, Arcom Control Systems
Arlen Nipper	President, Arcom Control Systems Inc
Glen Middleton	Managing Director, Arcom Control Systems Ltd
Chris Houghton	VP Engineering, Arcom Control Systems Inc
Sebastian Bain	Finance & Operations Director, Arcom Control Systems Ltd

Current Product Offering

Acromag offers a broad range of embedded I/O board solutions. Select from more than 100 I/O boards for VME, PCI, and CompactPCI systems as well as Industry Pack and PMC mezzanine module standards. These boards perform analog I/O, digital I/O, counter/timer, quadrature, and serial communication functions. New re-configurable FPGA I/O modules are ideal for developing custom analog and digital I/O boards. For more info visit www.acromag.com/embedded.cfm.

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- 400MHz Intel® PXA255 processor
- Ultra-low power 1.9W (typical)
- TFT/STN graphics controller
- 64Mbytes DRAM / 32Mbytes Flash
- Ethernet, USB and serial ports
- CompactFlash (CF+) and PC/104 bus

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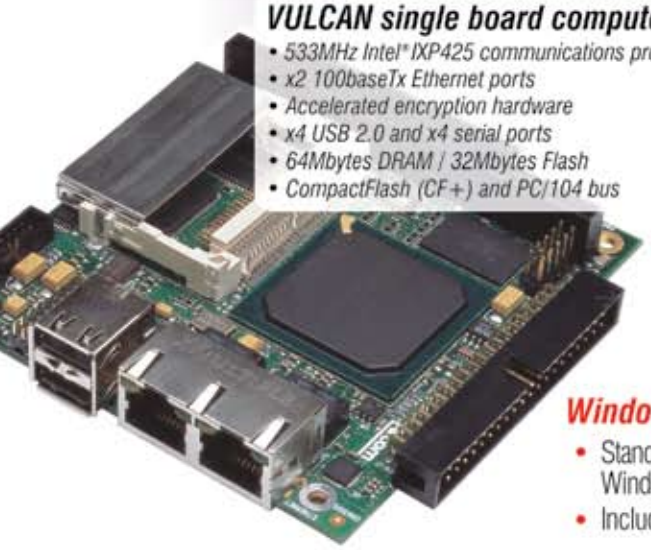
- 533MHz Intel® IXP425 communications processor
- x2 100baseTx Ethernet ports
- Accelerated encryption hardware
- x4 USB 2.0 and x4 serial ports
- 64Mbytes DRAM / 32Mbytes Flash
- CompactFlash (CF+) and PC/104 bus



Windows® CE .NET/5.0 Development Kit
- Standard build includes comprehensive set of Windows CE components
- Includes Embedded Visual Tools C++ Tools

Embedded Linux Development Kit
- Based on 2.6 kernel
- Optional embedded Java technology

VxWorks® Development Kit
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Combining the very best of low power Intel XScale® RISC technology and the industry standard PC/104 format.

Compact enclosure with 320 x 240 color TFT display and analog touchscreen.

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www.technobox.com

Mission/Vision Statement

To provide off-the-shelf PMC designs and products for a core PMC product line. Address custom PMC applications as derivatives of this core product line in order to quickly and cost effectively satisfy specific customer requirements with off-the-shelf products and custom designs.

Corporate Milestones

1991	FutureBus+ product initiatives, leading to PMC design and development
1995	Initial PMC products introduced, including Universal Video Interface
1996	PMC line expansion with addition of async interface modules and transition panels
1997	Introduction of PMC adapter and extender development tools, A/D converter cards, and reconfigurable digital I/0 modules
1998	Expansion of async module designs, Ethernet adapters, SCSI and IDE controllers, advanced reconfigurable I/0 designs, and increasingly more sophisticated tools
2002	Introduction of industry's first x86-based Processor PMC (PrPMC)
2004	Fifteenth Anniversary of Technobox

Lumberton, NJ

Consortium Affiliations

Member: VITA (VMEbus International Trade Association) www.vita.com

Associate Member: GroupIPC www.groupipc.com

Associate Partner: Wind River Systems www.wrs.com

Current Product Offering

Metering PMC-X to PCI-X Adapter with PIM Support
The Metering PMC-X to PCI-X adapter is a development tool that can be used for debugging and/or demonstrating the performance of a PMC or PIM card in a standard PCI slot.
http://www.technobox.com/NuDatasheet4311-A41119-Web.pdf

Robust hard disk adapter accepts a 2.5-inch HDD for operation on a PMC site. Flash drives may also be deployed. Silicon Image PCI680 supports Ultra 133 operation. http://www.technobox.com/NuDatasheet4170-A41119-Web.pdf

Dual/Quad 10/100-TX
Ethernet PMC-X Adapter, built around the Intel 82551ER, provides up to four Ethernet connections over twisted pair media. Options are available for Front-Panel RJ45 accessibility, or Rear I/O accessibility via a VITA 36 PIM module.
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Power Management: It's in the System

The recent escalation in power density could dramatically affect system operation and capabilities. Several bus architectures reveal significant new approaches to power distribution and system management.

by Michael Munroe
Elma Bustronic

It is fair to say that no single aspect of system design will have the potential to radically change the operation and capability of future systems as much as the dramatic escalation in power density. Until recently, system voltage distribution has continued to follow a downward trend, which is the result of low voltage signaling methods such as LVDS. However, to support a distributed 3.3v power bus means very high current levels. Therefore, to achieve higher power levels, system designers have resorted to bussed 12, 24 and 48 VDC, which is then downconverted on each board as required for the 3.3v components. At the same time, the focus of many new embedded architectures is to support the communication needs of both the public network infrastructure and industrial networking infrastructure applications where 48 VDC battery power is provided. Therefore, there is an additional compelling reason for designers to choose 48 VDC for power distribution, as in AdvancedTCA (ATCA).

Figure 1 A potential layout for a CompactPCI Express backplane. In this example, the power studs are located between the slots, providing maximum space savings.

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AdvancedTCA

Developers of the ATCA specification intended systems based on the spec to operate in today's typical unmanned central office environment, while remaining under closely coordinated control of a remote system manager. PICMG 2.9 is therefore an important subset of the 450-page specification. It includes the use of an Intelligent Platform Management Interface (IPMI) between various system components. This results in the ability to control fan speeds and board power consumption by the local system manager or a remote management entity in response to local environmental factors or the requirements of other system resources.

AdvancedTCA utilizes the concept of field replaceable units (FRUs). These could be node or switch boards, fan or blower assemblies, power inlet modules, power bricks or individual mezzanine modules on a carrier card. Power is typically supplied to an ATCA chassis through a power entry module (PEM), which is another FRU. This component provides filtering to control conducted emissions, over-current protection and transient fault protection. If an IPMI controller were added, it would make sense to also have a current or voltage monitor.

The ATCA specification provides for two 48 VDC power circuits: "A" and "B." Power distribution schemes are defined that allow both power circuits to be fed

separately. Alternately, if one battery feed fails a special circuit, it will allow the single remaining battery source to feed both the A and B backplane power domains. In addition, wiring instructions are defined to allow the backplane to be supplied by separate power systems. This redundancy would let each switch slot in a dual star system be on different power circuits. It is also possible to have separate power domains for each node card of a pair. Using such power schemes, highly fault-tolerant systems can be constructed.

MicroTCA

The MicroTCA specification had not been completed at the time this article was written. However, enough of its features have already been defined so that several detailed comments can be made with some confidence.

MicroTCA is a backplane architecture designed to support large numbers of removable AMC modules outside of an ATCA chassis. It defines the necessary wiring for a variety of different power source voltages. These power supply environments include: 48 VDC battery plants, 60 VDC battery plants, 24 VDC battery plants, 100V AC mains, 120V AC mains or 230V AC mains.

A modular power supply interface connector has recently been defined by the MicroTCA working group. It is intended that a variety of common modular power units will become commodity components so that any MicroTCA system can be equipped with the proper power supply modules for the power source environment where it is to be deployed.

The major difference between a MicroTCA chassis and an ATCA chassis is the power distribution approach. Unlike ATCA, which only provides 48 VDC on the backplane, a MicroTCA backplane provides 12 VDC and 3.3 VDC. The reason is that the AMC modules expect these voltages to be supplied and do not have provisions for being powered directly by 48 VDC.

In an ATCA system, the 12 VDC and 3.3 VDC are provided by the carrier card on which a given AMC module is supported. This means that in a MicroTCA

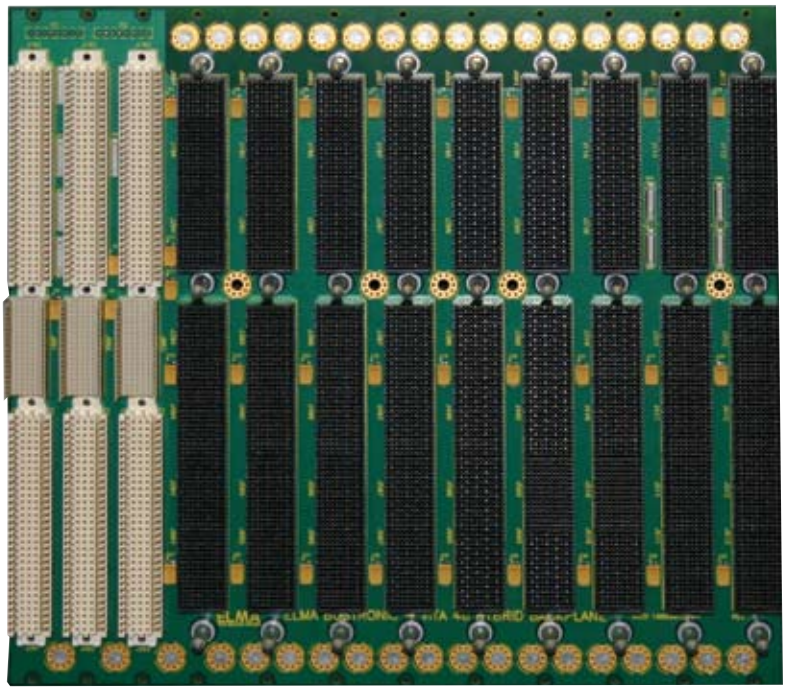

Figure 2 A sample configuration of a VITA 46 backplane. The specification allows a wide range of power options.

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Bus Architecture	BP Voltages	Special Voltages	Power Per Slot (based on pins)	Power Connector	Redundancy	Power Domains	Management Bus	I/O Signals
VME	5.0 12 -12	VPC 5STBY	108 W	DIN 41612 3-row	Not provided	1 each	VME	Sys Fail Pwr Good Fan Fail Sys Reset
VME64x	3.3 5.0 12 -12	+V1 -V1 +V2 -V2	174 W	IEC-61076-4-113 5-row	Not provided	1 each	VME IEEE 1149	Sys Fail Pwr Good Fan Fail Sys Reset
VXS	3.3 5.0 12 -12		174 W	IEC-61076-4-113 5-row	Not provided	1 each	VME IEEE 1149 IPMB (VITA 38)	Sys Fail Pwr Good Fan Fail Sys Reset
VITA 46	48 5	allowed	4,608W	MultiGig	Not provided		IPMB 1149	SYSRESET
CompactPCI	3.3 5.0 12	V IO	102*	2mm HM PICMG 2.11	Not provided	1 each	cPCI IPMB PICMG 2.9	Healthy
CompactPCI Express	12 3.3 5	5 Vaux eprom	225W Syst 250 type 1 34W perif	UPM 2mmHM PICMG 2.11	Not provided	1 each	cPCIe IPMB SMbus	PWR OK PWRBTN Alert PERST PWREN PS_ON PWRBTN#
AdvancedTCA	48	eprom	200 W	Custom	Yes	N + 1	IPMB PICMG 2.9	
MicroTCA	12 3.3	eprom	80 W	UPM, 2mmHM	Yes	+1	IPMB	

Figure 3 Power distribution and system management issues are resolved in various ways in many of today's bus or fabric architecture specifications.

system where the AMC modules plug directly into a common backplane, those voltages must be distributed to each slot by the backplane.

CompactPCI Express

CompactPCI Express is the natural migration path for cPCI systems. Each slot type has different power requirements. If all pins in a system slot were used to their maximum, the slot could draw about 480W. To keep power consumption under control, there is a stipulation that the combined current of all inputs for a system slot cannot exceed 45 amps. A Type 1 slot has a similar stipulation of 50 amps for the maximum combined power.

CompactPCI Express implements hot plug in accordance with the PCI Express Base Specification 1.1, and with the electrical requirements included in the PCI Express Card Electromechanical Specification Revision 1.1.

The CompactPCI Express specification permits power entry in accordance with PICMG 2.11, which uses the 47-pin Positronic power connector. This is the preferred implementation when a pluggable modular power supply must be used. The more typical implementation is press-fit power studs that are intended to be cabled to directly from a fixed power supply, using standard cabling, ring terminals, loc washer and hex nuts (Figure 1).

The electrical requirements for minimum decoupling capacitance, noise and ripple are tightly defined. For hot-plug boards there are additional requirements for maximum current slew rate, initial hot-plug capacitance, peak pre-charge current and maximum board capacitance.

VITA 41 VXS

The VITA 41 VXS standard is a convenient hybrid. It accommodates the established VME64x architecture, but provides a much higher center connector P0/J0 that supports four serial lanes of 3.1 to 6 Gbits/s for a cumulative bandwidth of 10 to 20 Gbits/s for each of two fabrics.

With the exception of the new MultiGig P0/J0 connector—which supports two high-speed fabrics, IPMI signals and a combined keying and guide module—the payload cards are unchanged. In the case of a dual star implementation, the two switch cards are implemented entirely with five new MultiGig connectors and a 6-pin Positronic power connector. This switch card power connector can supply 150W at 5 VDC.

VITA 46 VPX

VITA 46 VPX is the very latest VME-derived architecture. It may not be fair to judge this standard since it is not yet finished. VITA 46 references VITA 38 and requires that the two IPMB I^2C circuits be implemented in the backplane. JTAG signals may also be present in the backplane as part of the VME64x signals if VITA 46.1 is implemented in the VPX J1 connector. However, modules are not required to implement VITA 38 and no details have been provided to make such an implementation practical.

At present, backplane power voltage is designated to be between 5 VDC and 50 VDC and held to within 10% of the nominal. Peak-to-peak ripple must not exceed 10%. There are six contacts provided for +Vs1 and an equal number of -Vs1 return contacts. Six contacts are also provided for +Vs2 and an equal number of -Vs2 return contacts. Each contact is rated at 8 amps. A VITA 46 backplane layout is shown in Figure 2.

With 48 VDC supplied to the backplane, this could provide for a whopping 4,608W of power for each slot. Even with Vs1 and Vs2 allocated to 3.3 VDC, there would be provisions for 422W of power per slot. Luckily, VITA 48 is a mechanical chassis system that provides for liquid-cooled modules. This could be the explanation for this unusually generous power allocation.

There are no features in this standard that presently define power inlet module function, power initialization function, system management command set, conduction emissions, negotiated power usage or N+1 power redundancy.

Not all new architectures implement the same provisions for either system management or power distribution (Figure 3). However, where power distribution has been addressed, there is a trend for 48V distribution. Even for systems that are intended to be powered off of 120 VAC or 230 VAC mains, 48 VDC distribution still offers an important advantage by allowing lower current levels at the backplane interface while still meeting higher power needs.

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1992	January 16th, SBS goes public, traded as SBSE on the NASDAQ exchange
1995	SBS acquires modular computing manufacturer Greenspring Computers Inc.
1996	SBS acquires Logical Design Group and Bit-3 Computer Corporation
1998	SBS acquires control of German Industrial Computer manufacturer, or Industrial Computers GmbH.
2000	SBS acquires telecommunications equipment manufacturer SDL Communications
2003	SBS acquires Canadian operations office
2004	SBS opens Asian office in Shenzhen, Peoples Republic of China

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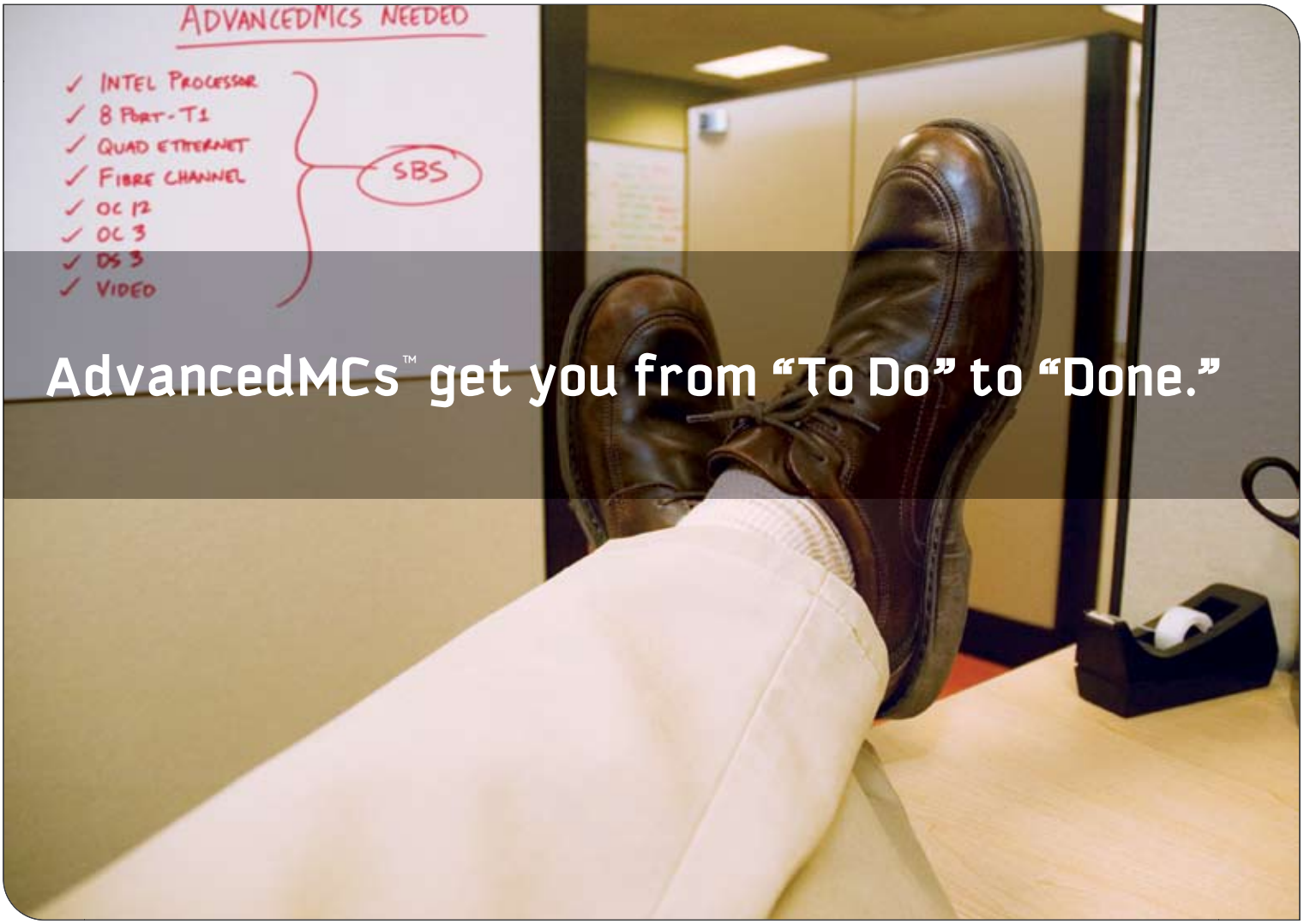

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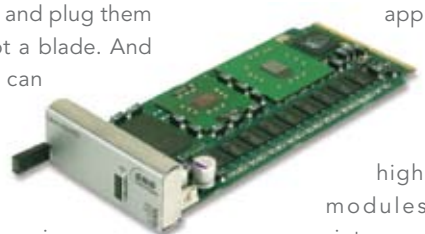

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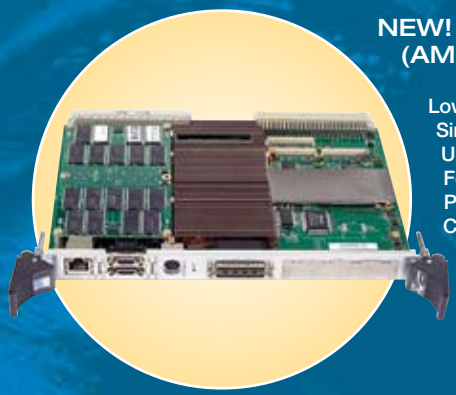

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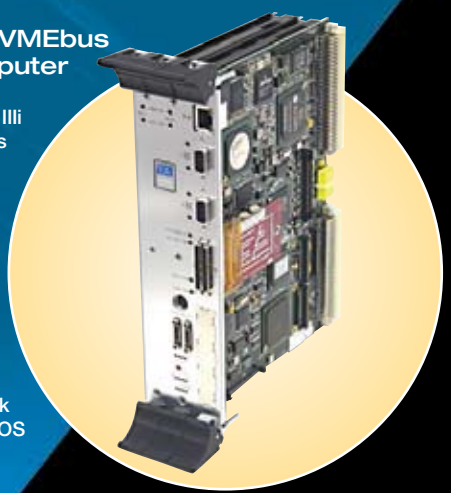

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CompactPCI Express: A Path to Performance and Compatibility

The new CompactPCI Express specification includes new connectors, new slot types, higher performance as well as future built-in performance upgrades. At the same time it maintains compatibility with previous generation systems and provides a clear path for upgrades.

by Steve Cooper
One Stop Systems

CompactPCI is based on the concept of taking mass-produced silicon from the desktop marketplace and using it within an industrial (Eurocard) form-factor. With the advent of PCI Express as the replacement for the PCI bus in the desktop, an evolutionary upgrade path is needed for the CompactPCI architecture.

A PICMG standardization committee has been working on this upgrade path for the past two years, and in June published the result: the CompactPCI Express, PICMG EXP.0 R1.0 Specification.

PCIe – The New PC Standard Bus Structure:

The new PCIe bus represents a breakthrough in terms of increasing bus performance while lowering system costs. This combined with a unified PC community ensures that PCIe will assume the expansion slot standard for the next decade. The enormous volume of the PC marketplace drives component makers to develop chips with native PCIe interfaces. For the industrial computing market, it becomes imperative to adopt the desktop PC standards, or risk not being able to utilize the mass-produced silicon.

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PCIe is designed to provide a superset of the functions provided by the traditional PCI and over time completely replace the older bus structure. PCIe can be used as an onboard chip-to-chip as well as a backplane board-to-board interface. In addition, PCIe can be run at full speed over a cable, enabling high-performance, software-transparent system-to-system applications.

In order to achieve higher performance and lower cost, PCIe takes advantage of low-voltage differential pair signaling (LVDS) with embedded clocking. This allows high frequency transfers on a small number of traces. The signaling is unidirectional, meaning that one differential pair is used to transfer data and another is needed to receive data. The bus is also point-to-point, so a separate interface is needed for each slot in a system.

PCIe is defined with a number of performance options. The most significant is the ability to route various numbers of lanes. A lane is defined as two differential pairs of signals, one operating in each direction as shown in Figure 1. The simplest PCIe connection consists of a single lane and is identified as a x1 configuration (pronounced “by one”). To achieve higher performance, designers can optionally run multiple lanes in parallel. Allowable lane options include x1, x2, x4, x8, x12, x16 and x32. PCIe can be used in two different system architectures, a tree or a network, as shown in Figure 2.

The first, the tree, is a standard CPU-to-I/O communications

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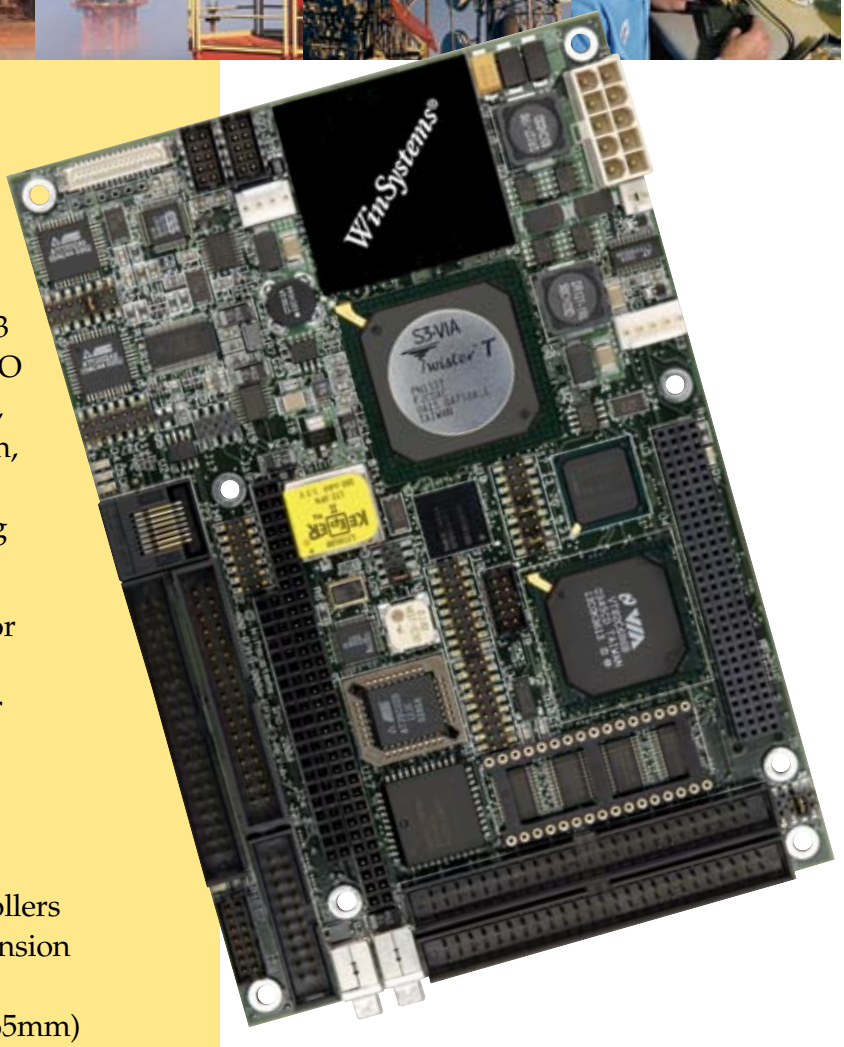

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VersaLogic Corporation is dedicated to engineering excellence, superior service and outstanding customer support. Versalogic's engineering team achieves design excellence through attention to detail, strict quality controls, and close communication and cooperation with customers. Our R&D and customer service focus allows us to develop boards with an emphasis on superior reliability, durability, and long-term availability. Our relationship with our customers is every bit as important as the products we deliver. With a philosophy of "treat every customer the way you would want to be treated," we look forward to assisting our customers, especially with technical challenges.

Corporate Officers

Len Crane	CEO/President
Gary Harris	VP Engineering
Tom Barnum	VP Sales
William Orleman	Production Manager

Current Product Offering

EBX Form Factor
The well-established EBX format (Embedded Board Expandable) is an excellent balance of size, economy, and functionality. This bolt-down SBC format supports embedded designs with higher performance CPUs and generous on-board I/O functions.

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PC/104

EPIC

STD 32

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Before Kristin Koons joined VersaLogic's sales support team, she guided tours at a natural history museum. She really knows how to keep products off the endangered species list.

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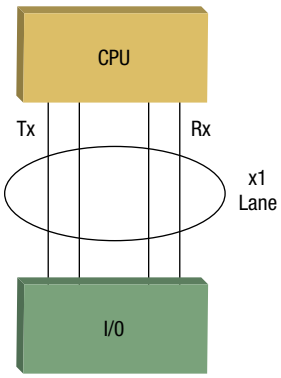

Figure 1 A PCIe lane is defined as two differential pairs, one operating in each direction.

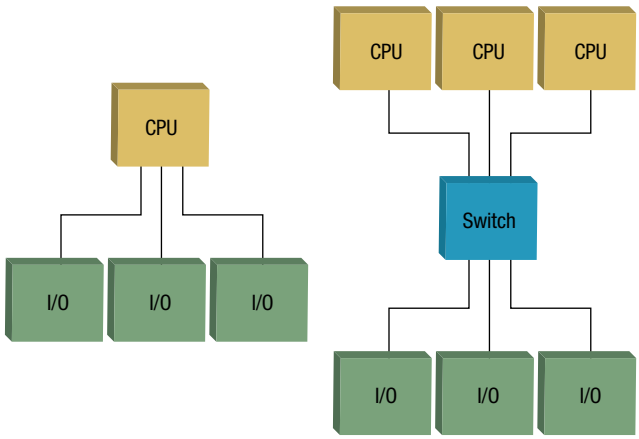

Figure 2 PCIe supports two system architectures.

bus, performing the same function that the PCI bus performs, but at higher speeds. This architecture assumes there is one, and only one, main CPU in the system. This CPU controls everything from basic power-up to initialization to running the main operating system. It is possible to have other CPU components providing intelligent I/O or secondary data processing, but there is always one main CPU.

The second usage model, the network, is a CPU-to-CPU (or system-to-system) networking model. In this model, PCIe will compete with other networking standards, such as Ethernet, but at a much higher speed. The key to using PCIe in a network model is the availability of Advanced Switching (AS). AS is an extension to the PCIe base specification that adds extra routing and protocol encapsulation information onto each PCIe packet. Intelligent switch chips, which allow boards that do not include advanced switching logic to intercommunicate with others that do include the logic, add this extra information.

The CompactPCIe specification fully supports both the tree and networking architectures. In a typical system, the only difference is the type of switch board used. For a tree architecture system, the switch board is based on PCIe switch components, whereas in an AS networking system, the switch board needs to be based on AS switching components. All of the

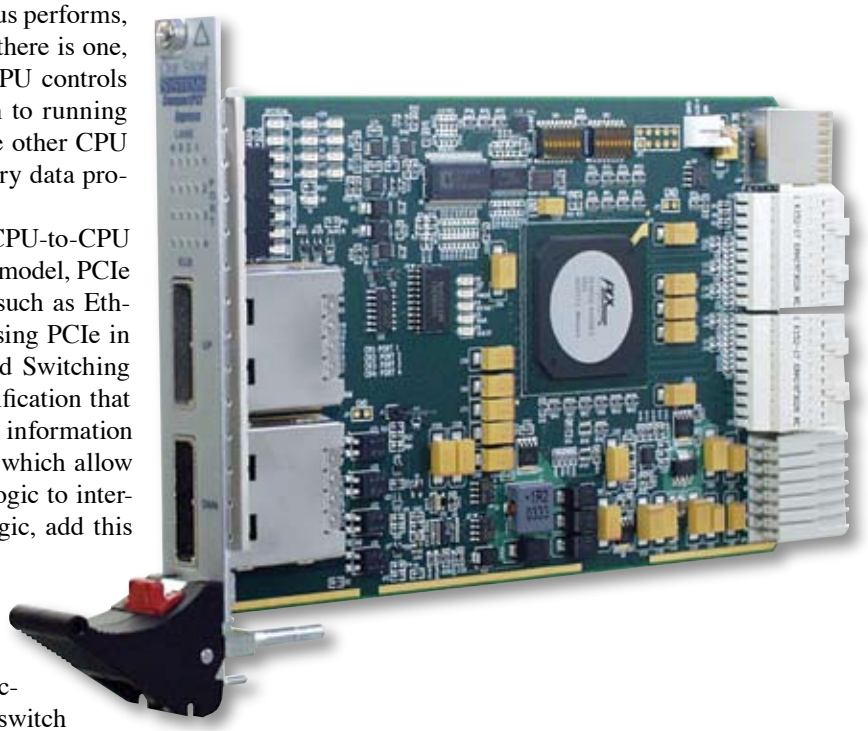

Figure 3 CompactPCIe 3U cable interface board.

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	Legacy Compact PCI	New CompactPCI Express
Common Features		
Board sizes	3U and 6U Eurocard sizes	Same
Face plates and ejector handles	IEEE 1101.10-compatible	Same
Modular power supplies	P47-based 3U and 6U modules	Same
Rear I/O	Routed through P3, P4 and P5 connectors	Same
Secondary buses	Routed through P3, P4 and P5 connectors	Same
Rear I/O	Routed through P3, P4 and P5 connectors	Same
New Features		
Bus	PCI	Multiple PCIe ports
New connectors	P1 and P2 for routing power and PCI bus	XJ1, XP2, XP3 and XP4 for routing power and PCIe ports
Voltages supplied	3.3V, 5V, 12V and -12V	3.3V, 5V, 12V and 5Vaux

Table 1 Similarities and differences between CompactPCI and CompactPCI Express.

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Mission/Vision Statement

Meeting the needs of our customers is our number one priority. We strive to provide the finest I/O solutions. We accomplish this by listening to customer needs and lead them by pioneering innovation in our designs. We also pledge to treat all customers and vendors in a fair, ethical way.

Dave Wolfe, President & CEO

8 Corporate Milestones

1957	Acromag incorporates to design and manufacture I/O products for industrial measurement and control applications.
1983	Begins developing EXORbus I/O boards
1985	Begins developing VMEbus I/O boards
1995	Introduces a line of Industry Pack I/O modules and carrier cards.
2001	Develops a line of PMC mezzanine modules
2002	Expands offering with PCI and CompactPCI I/O boards
2004	Releases digital I/O modules with re-configurable FPGAs for custom signal processing functions.
2005	Extends PMC line with FPGA analog I/O modules

Corporate Officers

Dave Wolfe	President & COO
Dr. John Venious	Vice-President of Engineering
Kurt Lipsky	Treasurer
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Wixom, Michigan, USA

Current Product Offering

Acromag offers a broad range of embedded I/O board solutions. Select from more than 100 I/O boards for VME, PCI, and CompactPCI systems as well as Industry Pack and PMC mezzanine module standards. These boards perform analog I/O, digital I/O, counter/timer, quadrature, and serial communication functions. New re-configurable FPGA I/O modules are ideal for developing custom analog and digital I/O boards. For more info visit www.acromag.com/embedded.cfm.

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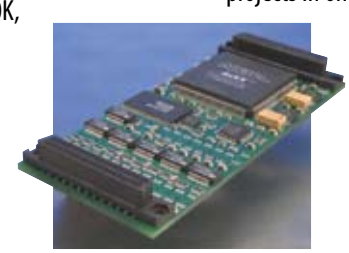

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other hardware in the system, including CPU boards, I/O boards, backplanes and chassis remain the same.

CompactPCIe

CompactPCIe utilizes many of the same features as legacy CompactPCI, but changes the PCI bus for the new PCIe bus. Table 1 highlights the similarities and differences between the existing CompactPCI standard and the new CompactPCIe standard. Many aspects remain unchanged, including the 3U and 6U form-factors, the faceplates and injector/ejector handles along with the P3, P4 and P5 user I/O and secondary bus connectors.

The area that does change is the P1 and P2 area. The connectors in this area are replaced by a total of four connectors that provide the PCIe interfaces and power to each board. For the most part, chassis designs do not need to change with PCIe, but the backplanes will need to be replaced with new PCIe backplanes.

CompactPCIe replaces the P1 and P2 connectors used in CompactPCI with new connectors that occupy the same physical area. These new connectors provide more power connections, high-speed differential pairs and a path for hybrid slots, which can hold either legacy CompactPCI or the new CompactPCIe I/O boards.

For 6U boards, the P3, P4 and P5 connectors remain unchanged from legacy CompactPCI. These connectors are commonly used for user I/O, rear I/O and secondary buses such as H.110 (telephony bus) and PICMG 2.16 (1 Gb Ethernet). A 3U cable interface board for CompactPCIe is shown in Figure 3. The changes listed in Table 1 are:

- **XJ1 Power Connector**: The first connector is a power connector with wide blades capable of supplying substantial power to each board. Power supplied in CompactPCIe is slightly different that in legacy CompactPCI, with 3.3V, 5V and 12V required. (Note that -12V has been eliminated). In addition, CompactPCIe adds the 5 V aux voltage, which allows CompactPCIe systems to utilize soft power-on or wake-on-LAN power-on consistent with desktop PCs.

- **XP2 and XP3 Advanced Differential Fabric (ADF) Connectors**: The second and third connectors contain the high-speed differential pairs that are the key to CompactPCIe performance. This connector has been simulated to operate at both the initial PCIe rate of 2.5 Gbits/s, and also at the future "Gen 2" rate of 5.0 Gbits/s.

- **XP4 Enhanced HM (eHM) Connector**: The eHM connector is a shortened version of the legacy P1 and P2 connectors. This connector provides several functions, including: rear I/O for 3U boards, geographic addressing, PXI signal compatibility and power for type 2 peripheral boards. Special keying is built into the connector shell of this connector to ensure that only boards that can handle a particular connector usage are installed into the appropriate slots.

Five slot types have been defined for CompactPCIe and can be seen in the backplane in Figure 4.

- **System Slot**: This slot type is designed to hold the primary CPU board or a cable interface board to an upstream computer. The system slot contains all four new connectors described above. The ADF connectors route either 2 or 4 PCIe ports. In the 2-port mode, one port is a x8 and the other a x16 lane port. In the 4-port mode, all four ports are x4 lanes.

- **Type 1 Peripheral Slot**: This slot type is designed for high-performance I/O boards and for secondary CPU boards. The slot definition is nearly identical to the system slot, and includes all four new connectors. The ADF connectors are routed with 2 ports, one as a x8 and the other as a x16 lane port.

- **Type 2 Peripheral Slot**: This slot type is designed for low-cost I/O boards. The slot only includes the top 2 connectors. The ADF connector contains a single x8 port. The eHM connector provides power and user I/O to the slot.

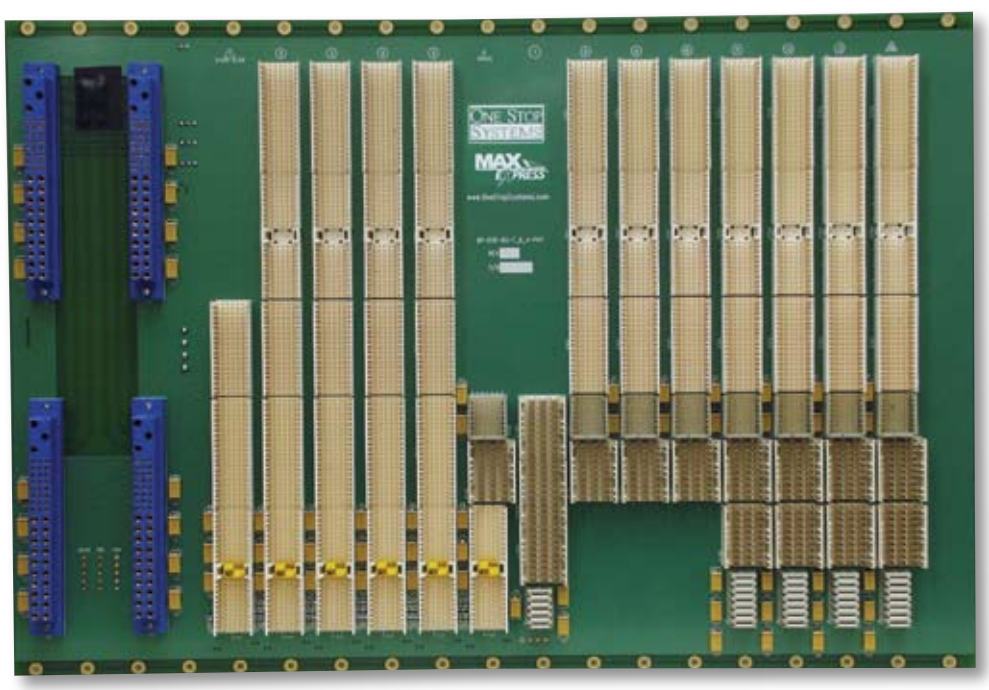

Figure 4 6U backplane with various slot types for CompactPCIe.

- **Hybrid Slot**: This slot type is intended to allow either legacy 32-bit CompactPCI I/O boards or new CompactPCIe type 2 boards to be plugged in. The slot contains a traditional P1 connector as well as the upper ADF and eHM connectors. Legacy boards need only include a P1 connector to be compatible with the hybrid slot. In addition, modified legacy PXI boards, where the P2 connector is replaced with the eHM connector, can be used in the hybrid slot.

- **Switch Slot**: This slot is intended to provide fan-out for all of the slot types. It contains a power connector and a large number of ADF connectors to accommodate all of the signals coming in from each slot. The 3U switch slot contains 3 ADF connectors and can connect up to 7 slots with x4 ports. The 6U switch slot contains 8 ADF connectors and can connect up to 19 slots with x4 ports. Dual switch slots can be included in a backplane to provide redundant ports to each slot.

Figure 5 Chassis supporting both CompactPCIe and legacy CompactPCI slots.

Mixed Systems

Over the next several years, CompactPCIe systems will likely include a mixture of legacy slots, hybrid slots and new CompactPCIe slots. This will enable designers to mix-and-match older boards with newer high-performance boards. Over time, more and more of the slots are expected to migrate to the CompactPCIe standard.

CPU modules will likely be the first modules to migrate to CompactPCIe. This is due to the rapid turnover rate of CPU board designs and the fact that newer chip sets now have PCIe ports.

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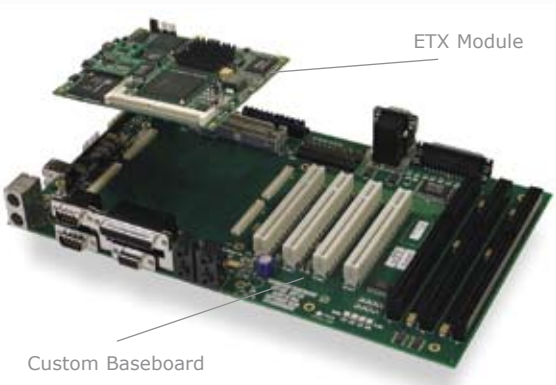

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Generic I/O boards, such as Ethernet, video and disk controller boards, will be the next to migrate to PCIe. This will again be driven by the underlying components. The latest components for these functions now include native PCIe interfaces. Thus, new designs using the latest components will utilize PCIe.

The last boards likely to migrate over to PCIe will likely be custom or low-volume specialty I/O boards. Some designers of these boards may choose the "easy" way out and add a PCI to PCIe bridge onto these boards. This minimizes the engineering effort involved in getting a legacy board to work in a pure PCIe environment. Although easier, this approach does not realize the performance advantages of PCIe, since the transfers end up going though legacy PCI and are throttled by its lower performance. A CompactPCIe chassis supporting both CompactPCIe and legacy CompactPCI slots is shown in Figure 5.

Future Performance Increases

The next-generation PCIe bus timing has been announced by the PCI-SIG. In PCIe 2.0, the data transfer rate will double from 2.5 Gbits/s to 5.0 Gbits/s. Components with the new "Gen 2" timing are expected to become available in early 2007, with systems appearing shortly thereafter.

The technical subcommittee that defined CompactPCIe took the future Gen 2 timing into consideration when defining the specification. All of the simulations for the proposed backplane and connectors were done at frequencies beyond Gen 2, providing confidence that the upgrade path will be straightforward.

The specification is defined such that Gen 2 boards will be compatible with the current backplanes and boards. In a mix-and-match system, each bus interface will auto-negotiate with its associated interface. They both will begin communications at the slower 2.5 Gbit/s speed and then let each other know if they have the capability to move to the 5.0 Gbit/s speed. Due to the point-to-point nature of PCIe, the presence of Gen 1 boards will not slow down high-speed Gen 2 boards in the same system. This technique will allow systems to take advantage of even higher bus performance, while maintaining total hardware and software compatibility. ◢

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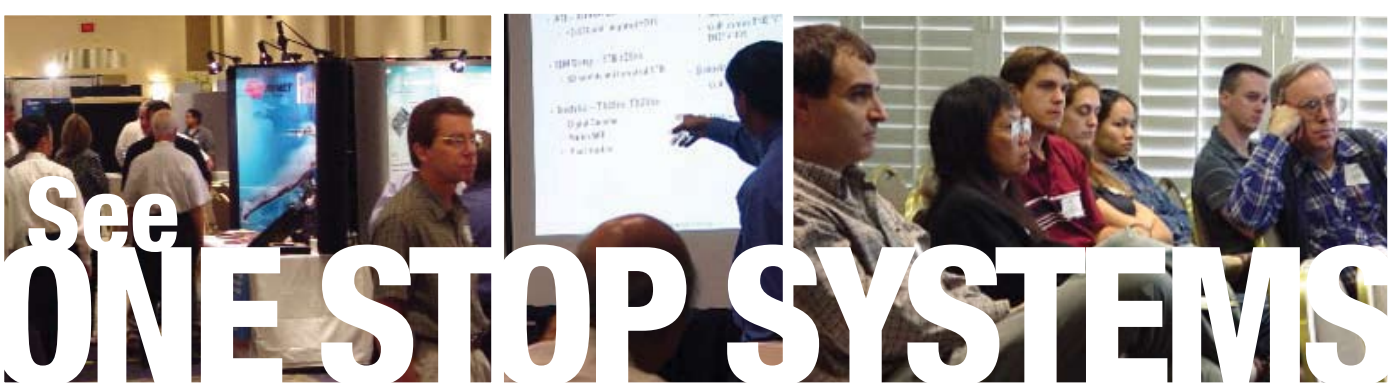

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Mission/Vision Statement

The Professional Leader in Innovative, Low Risk and High Performance FPGA Processing Solutions for Customers Challenging Applications.

Corporate Milestones

2005	Nallatech collaborates with Silicon Graphics Inc to customize and deploy FPGA Computing Solutions for the High Performance Computing Industry
2005	Nallatech Revenues increase by 80% Worldwide and 120% in North America
2005	Nallatech is a key partner and contributor to the Openfpga and FPGA High Performance Computing Alliance (FHPCA)
2004	Nallatech celebrated 10 years of business success in Scotland
2004	ISO – 9001:2000 accreditation quality standard awarded
2003	Nallatech secures $3.7 million in a second round of funding and appointed a new chairman
2002	FUSE™ system software introduced
2001	DIME-II™ architecture introduced

Corporate Officers

Mr. Iain Robertson	Chairman
Mr. Allan Cantle	President & CEO
Dr. Malachy Devlin	Senior Vice-President and Chief Technology Officer
Mr. John Nicholson	Non-Executive Director
Mr. George Freeland	Non-Executive Director

Current Product Offering

Nallatech offers a complete FPGA system solution, Hardware, Software and Enabling Tools. The COTS DIME-II FPGA computing hardware offers a combination of industry-standard form factors with high-bandwidth architecture. FUSE System Software enables developers to easily create complex processing systems with seamless integration between hardware, software and FPGA applications. DIMEtalk abstracts the features of the hardware platform to provide an easy to use development environment for implementing application on multi-FPGA systems.

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Mission/Vision Statement

To be a leading provider to OEM's and system integrators of a broad range of open architecture boards and systems for front-end data acquisition and digital signal processing used in sonar, acoustic test and measurement, radar, military and commercial wireless and RF test and measurement applications.

Corporate Milestones

1980	Incorporated to design and manufacture real-time data acquisition and DSP products for the global embedded sensor processing market.
1995	Develops innovative FPDP technology – a 32-bit, 160 Mbytes/sec, ribbon cable-based parallel data flow scheme.
1999	FPDP becomes an ANSI standard (ANSI/VITA 17).
1999	FPDP II unveiled.
1999	Chosen by Lockheed Martin Corporation for SQQ-89 sonar upgrade program to supply transmit/receive data acquisition boards.
1999	Enters communications market, and becomes leading developer of Software Defined Radio modules for defense radio applications.
2001	Delivers world's first Software Defined Radio-based satellite transponder demonstrator.
2003	Acquired by Radstone Technology, a supplier of rugged embedded computing products for defense and aerospace applications.
2004	Launch of first rugged transceiver.

Corporate Officers

Christopher Lever	Chief Operating Officer
Kelly Boutilier	Chief Financial Officer
Jonathan Jones	Vice President, Product Development

Current Product Offering

ICS is a powerhouse in the Embedded Systems industry and more specifically, leading designer and developer of software radio modules for defense radio applications such as radar, signal intelligence, secure communications, and tactical receivers. ICS is a member of Radstone Embedded Computing. www.ics-ltd.com

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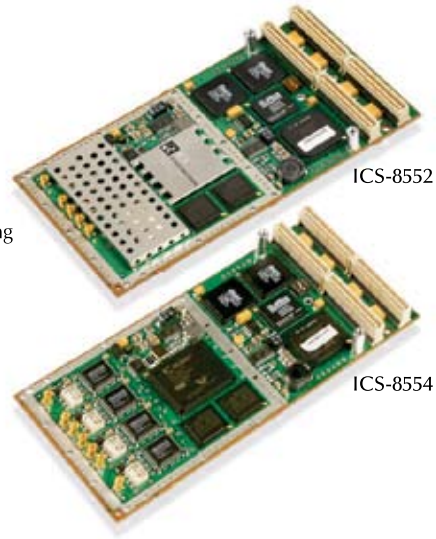

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Mission/Vision Statement

General Standards Corporation's mission is the leading provider of high performance PMC, PCI, CPCI, and PC104P analog, digital, and serial I/O boards for the embedded market.

We are achieving this through our commitment to customization, high quality, open standards, and customer satisfaction.

Corporate Milestones

December 1, 2005	Switching all new designs to larger FPGAs (Cyclone II)
February 11, 2005	Switched all new designs to 66MHz PCI interface
October 16, 2002	Introduced the first 64-channel simultaneous sampled A/D board
September 16, 2002	Introduced the first 64-bit, 66MHz, high speed parallel interface board
March 23, 2001	Made all PMC designs available on PC/104-Plus form factor
October 20, 2000	Completed development of our 1st Linux driver
July 8, 1999	Completed development of our 1st VxWorks driver
January 10, 1996	Introduced the first PMC board

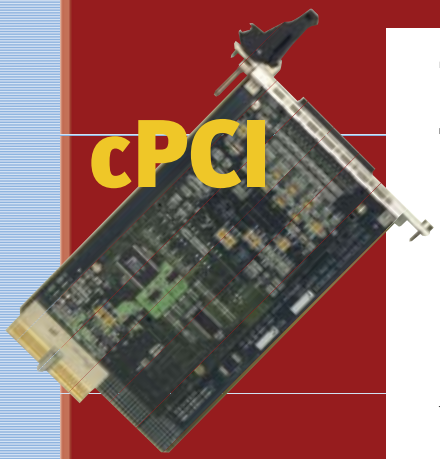
Corporate Officers

Paul Rainosek President

Current Product Offering

General Standards Corporation provides over 200 products including Analog, Digital and Serial I/O based upon a variety of buses such as PMC, PCI, VME, cPCI, and PC/104-Plus. Drivers are available for Linux, Windows, LabView and VxWorks.Our product selection guide can be viewed at http://www.generalstandards.com/tables.php

How to Choose a Data Acquisition Board



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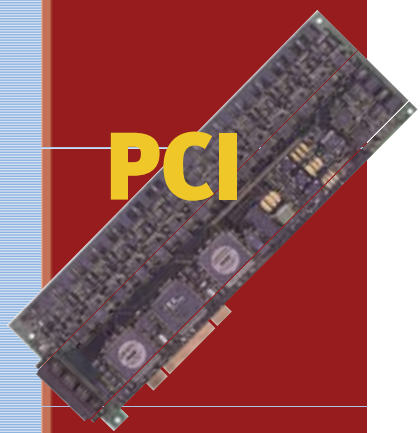
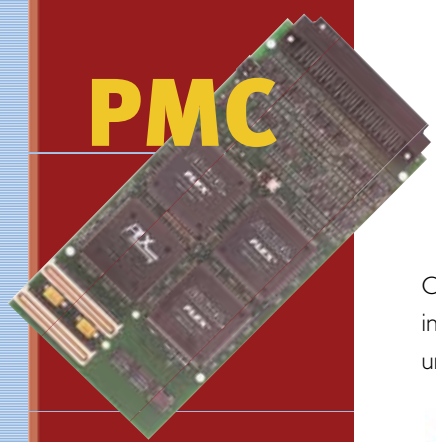


The following is a comparison of 24-Bit Delta-Sigma Data Acquisition Board Characteristics of General Standard's offering and the leading competitor.

	General Standards	Leading Competitor
Power Dissipation/32 Chan	12 Watts	35 Watts
Phase Skew	55ns (0.1 deg at 5KHz)	Not specified
Crosstalk	96dB	90dB
SINAD	93dB (cPCI, PMC, & PC/104+)	86dB (cPCI), 90dB (PCI)
Gain Accuracy	± 0.1mV, ± 0.1 percent	Not Specified
Sample Rate	200K per Chan (cPCI,PCI,PMC, PC/104+)	108K per Chan (PCI) 216K per Chan (cPCI)
Industrial Temp Range	-40° to 85°C	-40° to 85°C
Commercial Temp Range	0° to 65° C	0° to 50° C
Cost (32 Channels)	$5,995 (Qty 1)*	$9,000

* Cost is for Commercial Temp Version. Quantity discounts available.
Conformal coating available.



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SDR Development Platform Uses TI DSPs

Developers of two-way communication radios need the flexibility to produce a broad range of radio and waveform applications. A new software defined radio development platform from Sundance uses Texas Instruments' DSPs to provide a flexible rapid-prototyping solution.

The Sundance SMT8096 platform lets engineers design radios that can be easily upgraded and reconfigured to adjust to varying protocols. Based on TI's 1 GHz TMS320C6416T fixed-point DSP with a 64-bit external bus, the platform uses two TI ADS5500 14-bit, 25 Msample/s A/D converters, designed for applications that need low power, high speed and high dynamic performance in a small space. A TI DAC5686 dual 16-bit, 500 Msample/s D/A converter provides dual-channel, single-sideband and quadrature modulation.

The system's SMT310Q PCI carrier provides access to a TI module over the 33 MHz/32-bit PCI bus. The onboard XDS510-compatible JTAG controller lets developers use TI's Code Composer Studio and 3L Diamond software development environments. With a 64-bit/66 MHz PCI interface, the SMT145 carrier can be used for more demanding SDR applications, or a carrier such as the SMT148 can be chosen for embedded systems. The SMT8096 is fully compatible with MathWorks Simulink, and supports Windows, QNX and Linux environments. Single unit price is $8,395.

Sundance, Waterside, Chesham, UK. +44 (0)1494 793167. [www.sundance.com].

PMC Serial ATA Hard Disk Drive Module Offers 40 or 80 Gbytes

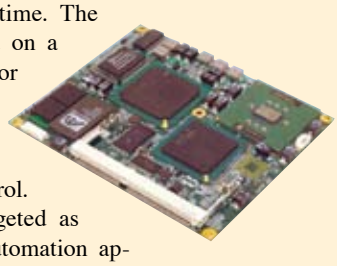
A new serial ATA hard disk drive module designed for use with single board computers or PMC expansion cards with support for universal signaling can be installed in any available 3.3V or 5.0V PMC site. The PMC-0247 from GE Fanuc Embedded systems uses a 2.5-inch hard disk drive and has a maximum capacity of up to 80 Gbytes. The hard drives can be either Serial ATA I or Serial ATA II-type drives.

Some of the features of the PMC-0247 include rotating media with 40 Gbyte and 80 Gbyte capacities; support for a programmable external flash for BIOS expansion and a 32/64-bit, 133 MHz maximum PCI-X interface. The module is available in standard operating mode or the continuous operating mode and is compliant with the VITA 39 specification. Operating system support includes Windows 2000, Windows XP and Linux Enterprise 4.0. Available immediately, the PMC-0247 is priced starting at $535.

GE Fanuc Embedded Systems, Huntsville, AL. (800) 322-3616. [www.gefanuc.com].

Computer-on-Module Supports Dual Graphics Displays

A new Computer-On-Module can show two independent processes on two different displays in real time. The ETX-P3Tx from Kontron is based on a 733 MHz Intel LV Celeron processor using the i815 and ICH4 chipsets. It includes an ATI Mobility Radeon M6 or M7 graphics controller with dual independent display control. This capability is particularly targeted as medical, gaming and industrial automation applications. The ATI Mobility Radeon supports CRT, LVDS, TMOS (DVI) and has a TV output. In CRT and LVDS modes, the module provides a resolution of up to 1280 x 1024 pixels. All in all, ATI Mobility Radeon controllers are designed for excellent graphics performance.

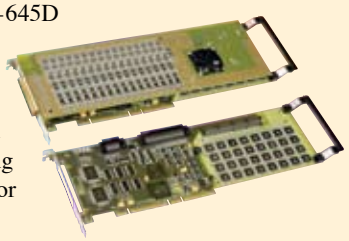


In addition to four USB 2.0 ports, the baseboard interface has 10/100 Base-T Ethernet and two serial TTL interfaces. There are additional pin-outs for keyboard, mouse, floppy disk and parallel port. Interfaces that vary depending on the application are controlled via a PCI bus. Up to 512 Mbytes of SDRAM is offered. The ETX-P3Tx module is fanless and cools the processor with a heat spreader that thermally couples the ETX module to the target system. Small quantity pricing is $340.

Kontron, Poway, CA (858) 294-4558. [www.kontron-emea.com].

Data Acquisition Board Delivers More Storage, Bandwidth

Designers of high-frequency sonar, test and measurement and radar applications are faced with the need for ever-increasing storage and bandwidth. The ICS-645D 32-channel data acquisition board from ICS, based on the company's 645C, improves on that board by boosting the amount of onboard storage and raising available I/O bandwidth over PCI or FPDP.



The ICS-645D includes two high-bandwidth data paths for communication with host systems. The 64/66 PCI interface provides data rates greater than 400 Mbytes/s sustained aggregate rate, while the FPDP II port delivers a dedicated connection for collecting data from multiple cards. Up to 16 Mbytes of onboard storage allow the board to tolerate unpredictable interrupt latencies encountered in non-RTOSs.

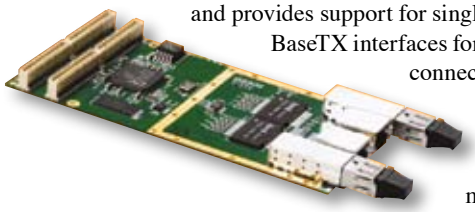
The board bundles A/D conversion, gain and anti-alias filtering resources in a single, full-length PCI board, removing the need for separate signal conditioning circuitry before the A/D conversion stage. Differential inputs, four voltage ranges and anti-alias filtering are included, as well as high-speed delta sigma AD9260 A/D converters with onboard gain and filtering. Pricing starts at $9,795.

Interactive Circuits & Systems, Part of Radstone Embedded Computing, Ottawa, Canada. (613) 749-9241. [www.ics-ltd.com].

Dual-Channel Gigabit Ethernet PMC Card

Powered by an Intel 82546EB Gigabit Ethernet Controller, the PGE2 from Curtiss-Wright Controls Embedded Computing is fully compatible with legacy 10/100BASE-TX networks and simplifies the addition of GigE networking into existing VME, CompactPCI or PCI embedded systems. It supports either single or dual 10/100/1000BaseTX using standard RJ-45 connectors or optical 1000BaseLX interfaces with LC-type fiber connectors.

The new GigE PMC card is available in both air-cooled and conduction-cooled versions. The air-cooled PGE2 comes with a standard operating temperature of 0° to +50°C. An extended-temperature air-cooled range version is also available and operates at -40° to +71°C using forced air cooling. The conduction-cooled version of the card is specified for operation over a range of -40° to +85°C and provides support for single or dual 10/100/1000 BaseTX interfaces for host board backplane connections.



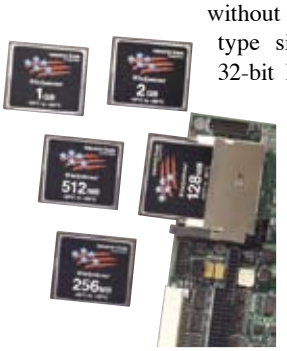
The card additionally features a 64 Kbyte FIFO buffer memory per port and MAC/SERDES support. It interfaces to a 32/64-bit, 33/66 MHz PCI bus. Software support for the PGE2 includes Intel's software drivers for Linux 2.2x and 2.4x operating environments and WindRiver's VxWorks drivers for the Tornado development platform. Single-unit pricing starts at $1,364.

Curtiss-Wright Controls Embedded Computing, Leesburg, VA. (703) 779-7800. [www.cwembedded.com].

Extended Temp CompactFlash Cards Target Industrial Apps

Although CompactFlash cards can bring versatility, inherent reliability and space savings to industrial storage applications, they must withstand rugged industrial environments and conform to specific industry standards. A new family of CompactFlash cards from WinSystems delivers extended temperature operating ranges, IDE HDD emulation and compliance with True IDE Mode and ATA-3.

The five cards, in densities of 128 Mbytes, 256 Mbytes, 512 Mbytes, 1 Gbyte and 2 Gbytes, operate from -40° to +85°C. Compliance with True IDE Mode and ATA-3 make them compatible with operating systems such as Linux, Windows CE and Windows XP Embedded without additional drivers. Samsung NAND-type single-level-cell flash and a dedicated 32-bit RISC/DSP-based system controller allow error checking and flash management schemes for additional levels of reliability and endurance. The cards have greater than 2 million program/erase cycles and unlimited reads while maintaining fast burst transfer speeds of up to 16.6 Mbytes/s. In addition, the controller supports Windows XPe's Enhanced Write Filter mode.

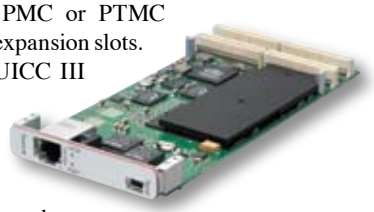


WinSystems' CompactFlash cards support a dual 3.3V/5V interface and meet CFA 2.0/2.1, PCMCIA PC Card Standard 7.0 and PCMCIA PC Card ATA Specification 7.0. List price starts at $45 for the CFLASH-128M-I, a 128 Mbyte industrial temperature unit.

WinSystems, Arlington, TX. (817) 274-7553. [www.winsystems.com].

ProcessorPMC Protocol Engine Based on MPC8540 PowerQUICC III

A new ProcessorPMC protocol and packet processing engine for telecom infrastructure applications gives telecom OEMs a simple way to add protocol processing and system management capability to telecom systems equipped with PMC or PTMC (PCI Telephony Mezzanine Card) expansion slots. Based on the MPC8540 PowerQUICC III communications processor, the Pm8540 from Artesyn Communication Products also features two Gigabit 10/100/1000BaseT Ethernet ports, which are routed to the PMC connector, and one 10/100BaseTX Ethernet port, which is routed to the module's front bezel.



The Pm8540 also features up to 512 Mbytes of SDRAM, 32 Mbytes of flash memory, an I^2C bus system management controller and a four-channel DMA controller, which boosts overall performance by facilitating high-speed data movement between module resources without CPU intervention. Freescale's MPC8540 provides the compute and protocol acceleration engine for the Pm8540 with a peak performance of 2310 MIPS at 1 GHz. The MPC8540 also features 256 Kbytes of L2 cache, a DDR SDRAM memory controller, two Gigabit 10/100/1000BaseT Ethernet controllers, a 10/100 Ethernet controller, a 64-bit PCI/PCI-X controller operating at speeds of up to 133 MHz, a parallel RapidIO controller and the OCeaN non-blocking crossbar switch fabric. The Pm8540 operates from a 3.3 or 5 VDC power supply, consumes 11.5W typical, and operates over a 0° - 55°C temperature range. Software support includes Carrier Grade Linux. OEM quantity pricing is $759.

Artesyn Communication Products, Madison, WI. (608) 831-5500. [www.artesyn.com].

PCI Mezzanine Card Targets High-Speed Data Acquisition

Targeted at advanced high-speed serial data acquisition, the PMC-HTTLK IO mezzanine card from Thales Computers is designed to meet the needs of compact, real-time systems running defense and aerospace applications. The module offers high-speed data acquisition along with point-to-point data transmission. PMC-HTLK is a 64-bit PCI mezzanine card (PMC) that is capable of moving data to and from PCI-accessible memory using either a HOTLink II transmitter channel, a HotLink II receiver channel or a 32-bit-wide parallel data port P4DP. P4DP is a 32-bit rear-panel variant of the front panel data port (FPDP) that runs at a software-programmed clock rate of up to 40 MHz. PMC-HTLK supports three speeds—high speed (1 Gbit/s) and two low speeds (350 Mbits/s and 320 Mbits/s)—and is available in commercial and rugged air-cooled and conduction-cooled versions.

The PMC-HTLK is designed as a serial I/O card to be used for high-speed data acquisition when the front panel data port does not meet the needs of the user due to the length of the link or when the cabling is difficult to support. Pricing for the PMC-HTLK starts at $2,690 depending on specifications.

Thales Computers, Raleigh, NC. (800) 848-2330. [www.thalescomputers.com].

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- Founded in 1998
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- ISO9001 Quality management
- Technology leader, Organized technical committees and authored technical specs for implementing PCI Express in industrial-grade computers
- First-to-market with PCI Express products
- Leading manufacturer of PCI Express products, Expansion products, Advanced switching products, Enclosures and backplanes
- Continue leadership role in standardization bodies, We formed the committees to standardize PCI-Express, We are co-authoring the specifications, We are a key spokesman/advocate for the technology

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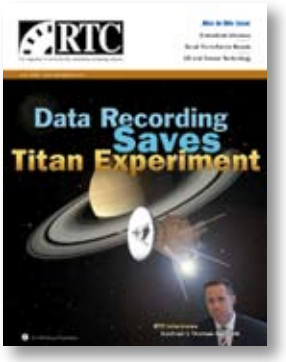

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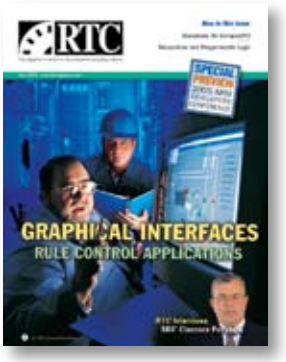

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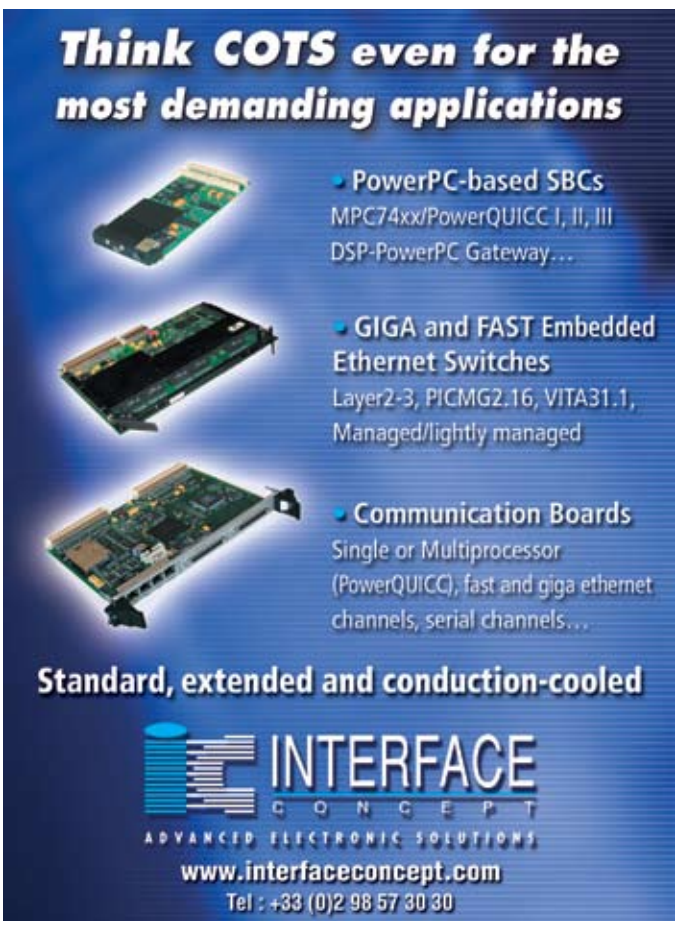

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The Othello line of VME carriers include two high speed mezzanine sites, large on-board buffer memory, and optional connectivity to switch fabric backplanes.

Othello architectures are optimized for rate buffering data between the mezzanine sites (PMC or XMC) and switch fabric backplane. In addition to having independent Serial RapidIO, RACE++, or StarFabric ports on the backplane, full connectivity is provided between all on-board devices.

Based on Micro Memory's CoSine System-on-Chip, the MM-1300D and MM-1400D also support FPGA processing for application specific state machines in its custom User Programmable Logic (UPL) block.

Consortium Affiliations

Micro Memory is an active member of industry trade associations including PCI-Sig, the RapidIO Trade Association (Sponsoring Member), and VITA.

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Mission/Vision Statement

Micro Memory is a leading provider of high performance board-level products for streaming signal and image processing, real time data acquisition, and enterprise network storage.

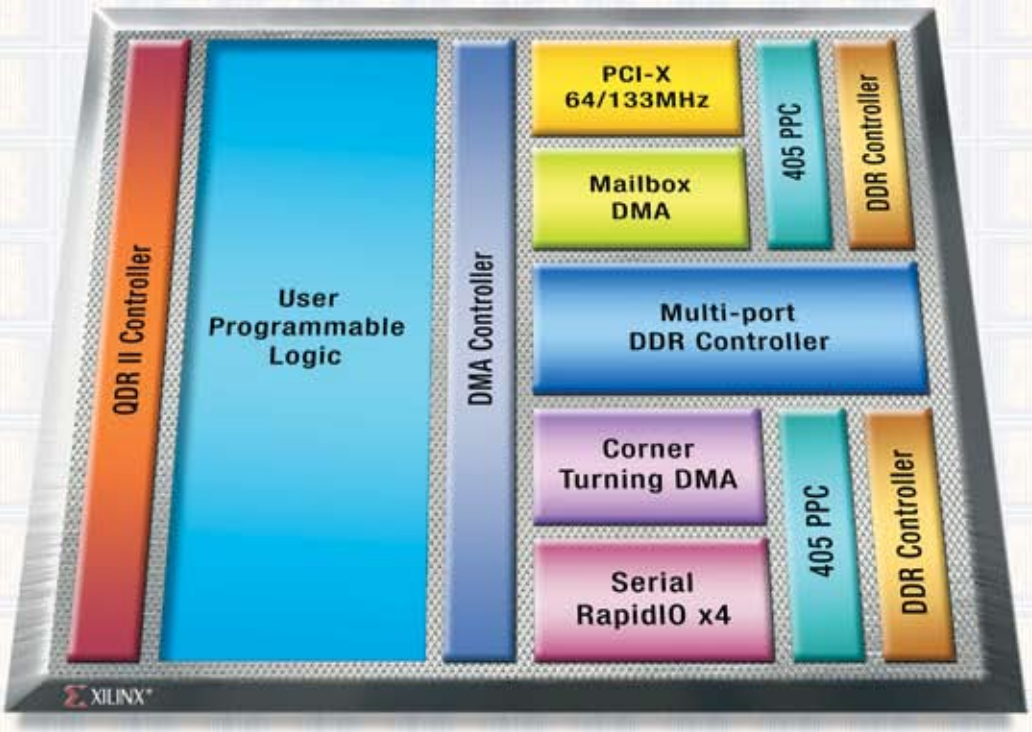
Founded in 1976 and previously a business unit of Litton Data Systems® (now Northrop Grumman®), Micro Memory has had a specialized focus on command, control, communications, computer, intelligence, surveillance and reconnaissance (C4ISR) applications for thirty years.

Based on a combination of industry leading technologies and company proprietary IP, Micro Memory's portfolio of products successfully address the performance, life cycle management, and product obsolescence challenges associated with these demanding applications.

Corporate Milestones

1976	Company founded and immediately begins supplying Multi-bus products to industry leading OEM customers.
1985	Introduction of the company's first products based on the VME bus architecture.
1995	First Mercury Computer Systems partner to release an off-the-shelf RACEway product, the MM-6490D VME64/RACEway memory buffer.
2001	Company establishes leadership position in supplying COTS products deployed into high profile airborne radar systems such as the Global Hawk, Predator, and U2.
2004	Released the line of Othello™ VME carriers for switch fabrics, combining large buffer memory nodes with an embedded processor, PMC sites, and fabric connectivity in an application optimized architecture.
2005	Released CoSine™, the industry's first fully integrated System-on-Chip for FPGA processing.

CoSine™ SoC



System-on-Chip for FPGA Processing

CoSine is a fully integrated, completely preconfigured System-on-Chip for real time FPGA based signal processing. Bridging two high speed interfaces (Serial RapidIO®, PCI-X®, or PCI-Express®) through a multi-port DDR controller, the elegant design enables non-contentious access to a User Programmable Logic (UPL) block.

Similar to a structured ASIC, the IP cores, memory controllers, specialized DMA engines, embedded processors and surrounding logic are factory preconfigured and supplied as a fully tested system. This provides users the ability to focus on application specific state machine processing in the UPL block without concerning themselves with coding other modules, complicated SoC integration, or verification.

The CoSine development toolkit includes a standalone ATCA® board with up to 8GB of DDR that demonstrates continuous sustained transfers from a 64-bit/133MHz PCI-X PrPMC site at maximum bandwidth through CoSine to a Serial RapidIO x4 XMC site. Along with a complete *"How to"* Developer's Manual, the kit includes a demo program using an off-the-shelf Xilinx 1024 FFT, robust library of VHDL test benches, and extensive suite of PCI, sRIO, and standalone diagnostic "C" test code.

CoSine will also be offered on several forthcoming XMC, AMC, and Othello VxS® VITA 41 and 46/48 formats in both commercial and conduction cooled options.

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